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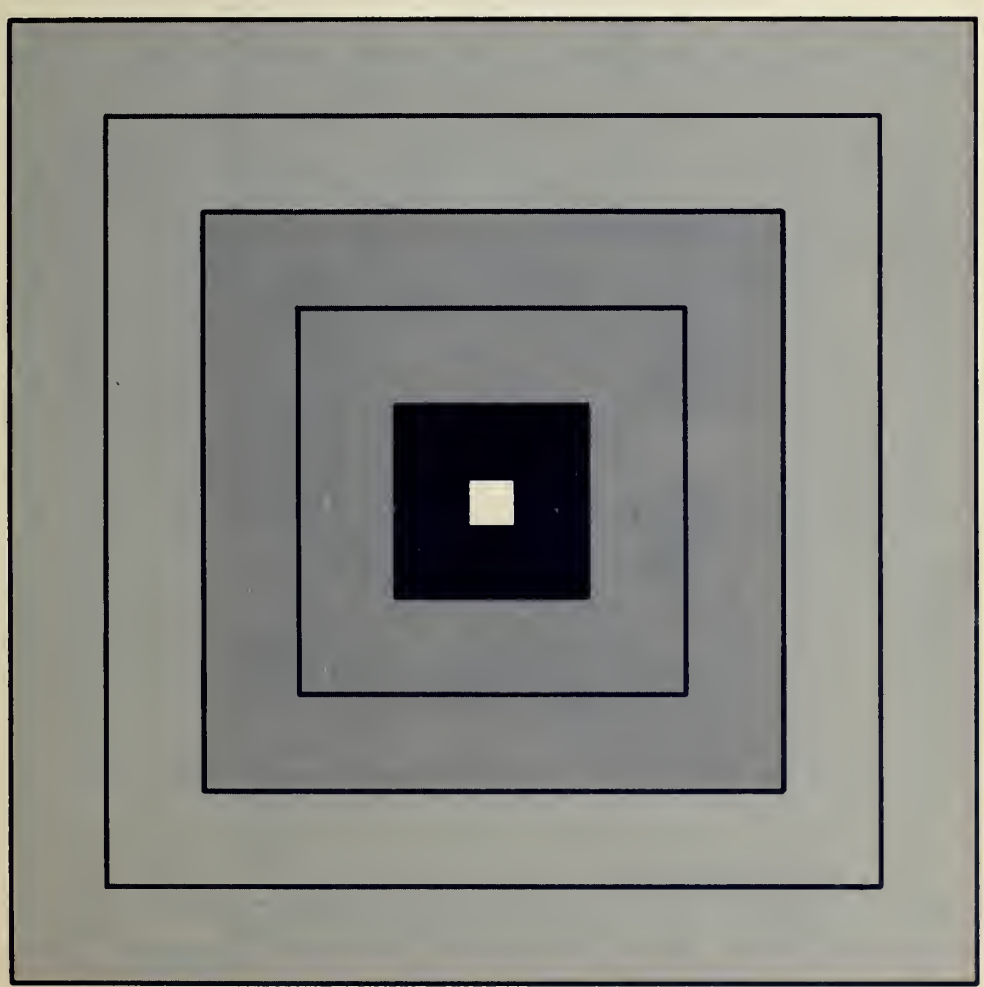
The U.S. Photographic Industry 1963-73 an Economic Review



U.S. DEPARTMENT OF COMMERCE
Domestic and International Business Administration
Bureau of Domestic Commerce

The U.S. Photographic Industry 1963-73 an Economic Review

U. S. DEPARTMENT OF COMMERCE
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THE U.S. PHOTOGRAPHIC INDUSTRY, 1963-73

Executive Summary

Photography today is infinitely more than a camera and a cartridge of film. It has become a functional tool associated with many complex and multipurpose applications. Revolutionary developments since 1960 in photographic equipment have had highly favorable impacts on many industrial processes and in the fields of science, medicine and education.

This report provides an understanding of the photographic industry's important contributions to the economy and an insight into the factors that spurred its phenomenal growth during the 1963-73 decade. The report describes the products classified in the photographic industry and examines their applications, the marketing and industry structure and the industry's competitive position in world production and foreign trade.

- The industry entered a period of sustained growth in the 1960's. New demand was stimulated by the introduction of new products and processes created through heavily funded R&D programs.

- Innovations and improvements in equipment gave rise to new technologies and greatly expanded the use of photographic techniques.

- Improvements in X-ray screen and film have permitted lower dosages to patients.

- Photographic techniques benefiting the commercial-industrial-professional user include, as examples:

  - microfilming - eases the handling, storage and retrieval of information;

  - photocopying - saves time, labor and increases efficiency;

  - photocomposition in commercial printing - replaces the slower hot-metal typesetting method;

  - photofabrication - replaces slower mechanical methods of milling and tooling of engineering and electronic components;

- and in the electronics industry, micrographics and photofabrication have made possible micro-miniaturization of electronic circuits or integrated microcircuitry.

° The development of the pocket-sized, cartridge-loaded Instamatic camera, the Polaroid self-developing camera and improved color film have created a large amateur-consumer demand.

° Shipments of photographic products increased from $1.6 billion to $6.3 billion in the 1963-73 decade. The two largest items in this total were photocopying equipment and photographic sensitized film and plates, each representing approximately $1.9 billion of shipments in 1973.

° The industry is highly concentrated. Four out of 554 companies accounted for 75 percent of the industry's value of shipments in 1972.

° Geographically, the northeast region of the U.S. produced about 80 percent of the industry's output and accounted for 73 percent of total industry employment in 1972. Located in this region are the major manufacturing facilities of Eastman Kodak, Xerox, Polaroid and GAF.

° The U.S. continues to be the major exporter of photographic products. In 1975, exports were valued at $1.1 billion, almost a 7-fold increase over the $161 million exported in 1963.

° The U.S. share of the world exports has declined due to the expansion of foreign production and increased output of U.S. overseas subsidiaries.

° Exports of U.S. photographic products rose faster than imports resulting in consistently favorable annual trade balances. The $70 million surplus in 1963 grew to $574 million in 1974 and decreased to $527 million in 1975, a seven fold increase over 1963. In comparison, the total U.S. merchandise trade balance declined during the period from a surplus of $5.2 billion in 1963 to a deficit of $3.7 billion in 1974. In 1975, however, there was a trade surplus of $9.5 billion.

THE U.S. PHOTOGRAPHIC INDUSTRY - ITS IMPORTANCE IN THE ECONOMY

Photography is usually thought of as picture taking, embodying a camera, a roll of film and a projector. This was essentially the mainstay of the photographic industry prior to World War II. During the post World War II years and especially in the 1960's, the industry moved rapidly in the development of new products and techniques that have had a revolutionary and highly beneficial impact on many sectors of the economy.

In many instances modern photographic techniques have led to innovative processes, greater productivity and lower labor costs for technologies such as microfilming, printing, computers, electronics, television, instrumentation, audiovisual communications, reproductive processing, medicine, photogrammetry, photofabrication and for other scientific and technological areas.1/ A number of these technologies are examined here in relation to the photographic equipment use.

Audio-visual communication uses still and motion picture cameras and slide and movie projectors for recording and presenting informational, educational and training material to a wide range of markets including schools, colleges, government, business, industry, medicine and public health. While audio-visual communications grew during the 1960's, competitive video tape recorders and closed TV circuit equipment made inroads. The competition, however, stimulated the industry to improve the equipment's design, capability and productivity.

Commercial printing, a $9 billion industry, is well along in its conversion to offset printing. Photocomposition, as it replaces hot-metal typesetting (linotype and monotype), uses equipment such as process cameras, film processors, plate

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1/ This has been facilitated by the industry's use of electronics to perform a variety of control functions that were previously handled mechanically. Modern electronic components such as integrated circuits, process amplifiers, integrated voltage control systems, silicon-transistors, diodes, photocells and miniature resistors are used to replace gears, levers and springs of a mechanical camera. Electronic components, circuitry and computers are used to increase the speed and automation of film processing equipment, photocopying equipment, microimage retrieval systems and phototypesetters.

exposure units and offset plate making equipment. Capable of reproducing as much as an entire page of text in a single operation, phototypesetting has been a boon to productivity in the printing industry.

Micrographics uses basic photographic concepts to reduce original documents to microimages on microfilm. Improvements in microfilming equipment has eased the handling, storage and retrieval of information. The equipment's rapid growth reflects the demand for greater efficiency in record management and information retrieval and for savings in storage space as proliferation of printed matter continues. A microfilming system includes camera recorders, film processors, duplicators, readers which magnify the microimage into readable form, reader-printers which reproduce readable paper copies and retrieval systems which give quick access to microfilm data banks.

Photocopying has become a time and labor-saving method in the reproduction of printed material. Copiers that use plain paper have been increasing in popularity with many users.

Photogrammetry is the science of making reliable measurements by the use of aerial photographs in surveying and map making. Accelerated by the demand for military reconnaissance during the Vietnam conflict, aerial photography, a highly complex technology, continues its important role in the U.S. space program in photographing earth and its satellites. Increased demand for photographic equipment stems also from civilian aerial mapping projects such as crop studies, flood control, re-forestation, urban planning and assessment of ecological conditions. Demand can also be attributed to the increase in marine reconnaissance and underwater photography in recognition of the importance of the underwater environment.

Photofabrication, a photo-etching procedure is being substituted by some manufacturers for mechanical tooling and milling in the fabrication of components of intricate design. First used in the production of printed circuits to replace handwiring, it is now the means of producing miniaturized electronic integrated circuits used in the production of microprocessors and microcomputers that are radically changing present day technology.

Photography has become useful in many industries, such as: chemical, oil, gas, electricity, and others which use measuring and process control instruments. Automatic cameras record the instrument readings for a permanent record thereby freeing operating personnel for other tasks.

Photography assists in quality control through non-destructive testing by X-rays. Castings, welds and finished components can be examined for internal flaws without destruction. Photography is also used in time and motion studies to analyze manufacturing methods, assembly operations and machine movements that are too rapid for visual observation. Motion picture cameras are used in examining the efficiency of motors, relays and switches.

Photography in medicine and health care provides a vital service in detection, treatment and prevention of disease, constantly increasing the sophistication and the speed with which physicians have access to data. There is increased utilization of photography in the clinical aspects of patient care, research and development, improved diagnosis, and in the education of the hospital staff. X-ray techniques have become highly perfected in reaching areas within the body cavity which are obscured in ordinary radiographs. An example would be the X-ray of the pancreas using computer-axial tomography. With the improvement of X-ray screen and film, lower dosages can be administered to patients. Still and motion pictures taken of patient examinations in dentistry, ophthalmology, orthopedics, dermatology, surgical operations and nuclear medicine provide pictures for evaluation, diagnosis, and visual records for future reference and for preparation of training films.

Photographic applications in science include pictorial records of scientific experiments which permit accurate visual records at each stage of an experiment for analysis and evaluation, thus circumventing observations or measurement limitations of human vision. In electron micrography (photo-micrography), for instance, in which a beam of electrons performs in the same manner as a beam of light does in an optical microscope, the study and analysis of minute specimens can be made under magnification of 4000 times and over.

Photospectroscopy records the measurement of light wavelengths, while ultra-violet photospectroscopy is used in the quantitative analysis of metal alloys.

High-speed photography uses motion picture cameras which record at rates exceeding 20,000 frames per second to track missiles, space craft and rockets traveling at supersonic speeds. Infra-red photography which penetrates fog, mist and darkness is required in aerial reconnaissance and in many scientific studies where darkness restricts the use of conventional photography.

The motion picture and television industries employ cameras, film, lighting equipment, film processors, projectors and other photographic supplies. Although a fair amount of television is programmed on videotape - a magnetic tape - the overwhelming percentage of television time originates on photographic film. Larger attendance at the movies and the trend toward more numerous and smaller modernized theaters have resulted in increased demand for improved and automated photographic equipment.

Other applications which play an important but smaller role in terms of total industry value of shipments are police photography for criminal records and crime detection, astronomy, and archaeological research, advertising and fashion design.

MARKET OVERVIEW

Marketing Channels

Photographic products fall into eight major product classes. Each class includes hundreds of products that are distributed differently through channels that vary according to the end-use market served, i.e., the amateur-consumer market and the commercial-industrial-professional market. (Table 1 lists the 8 product classes, the general photographic items in each class, and a description of their uses.)

Distribution of photographic products follows no set pattern. Imports may be distributed to the retail outlet by an independent distributor, by the representative of the foreign manufacturer or by the foreign manufacturer's own organization in this country.

Domestic production is marketed in several ways. Many amateur-consumer products are sold to independent photo dealers and other retail establishments by manufacturer's regional distribution centers which are supplied from central warehouses. Numerous companies, however, ship directly from the plant without regional distribution. There are others who rely on independent distributors or a combination of direct shipment and independent distributors. Although many photographic products for the commercial-industrial-professional market are sold by the manufacturer to the user, the distribution is also handled by independent distributors. Chemicals and sensitized papers are distributed in like manner to the photo-finishing user. Manufacturers usually provide technical

Table 1. - PHOTOGRAPHIC PRODUCTS AND APPLICATIONS
(Standard Industrial Classification SIC 3861)

Product Class	Commodities	Uses
Still Picture Equipment (38611)	Still cameras, accessories	Apparatus for recording images on film; for photo-engraving and photolithography; in the production of integrated circuits and fabricated products.
	Process cameras	
	Slide film projectors	Viewing slide transparencies.
	Processing and finishing equipment	Development and finishing of exposed film.
Motion Picture Equipment (38613)	Movie cameras and accessories	Apparatus for recording a series of images on film.
	Projectors	Viewing movie film on projection screens.
	Processing and finishing equipment	Development and finishing of exposed movie film.
Photocopying Equipment (38612)	Copiers based on diazo, thermal, direct and transfer electrostatic processes	Equipment for producing copies of letters, documents and engineering drawings.
Microfilming, Blueprinting, Brownprinting, and Whiteprinting Equipment (38614)	Microfilm cameras and processors, readers and printers, duplicators and retrieval systems	Cameras record documents into a microimage format. Processors develop the microfilm. Duplicators produce additional microfilm copies. Readers magnify the microimage into human readable form. Printers reproduce microfilm into hard-paper copies. Retrieval systems provide access to microfilm storage banks.
	Blueprint, brownprint and whiteprinting equipment	Used in drafting and reproduction of engineering drawings.
Photographic film and plates (38615)	Still picture black and white and color roll film	For use in still cameras to record images on a silver halide emulsion.
	Sheet film	A film pack containing pieces of cut film attached to paper separators, used in "instant" and large format cameras.
	Motion picture black and white and color film	Processed to a final positive transparent image, rather than a negative image as in still photography, for direct viewing on a projection screen.
	X-ray film 1/	Medical & dental diagnosis and industrial non-destructive testing.
	Graphic arts film	Used in transferring images to printing plates.
	Microfilm	Used in micro-imagery.
	Plates	Used as sensitized printing plates.
Sensitized photographic paper, & cloth, silver halide type (38616)	Continuous-tone reproduction paper	Used in photofinishing laboratory and home dark room.
	Line reproduction paper	Used in the printing process as a line reproduction positive.
Sensitized photographic paper, & cloth, other than silver halide type (38617)	Blueprint, brownprint and diazo type paper	Used in drafting and reproduction of engineering drawings.
	Paper for photocopy processes	Used in photocopying equipment as final document image copy
Prepared photographic chemicals (38618)	Chemicals having the characteristics as a reducing agent, solvent, an accelerator, a preservative, stop bath and fixer	Used in photofinishing to develop negatives and to produce positive prints, slides and movies.

1/ Reclassified in a separate product class 38619 in the 1972 Census of Manufactures

information to enable the customer to adapt the equipment to his needs.

Exports of U.S. photographic products are made to foreign distributors as well as to U.S. overseas sales subsidiaries. Overseas subsidiaries producing photographic products may also be supplied with product lines whose production overseas is not economically advantageous.

In 1973 amateur-consumer sales were estimated to account for 30 percent of the total photographic product sales, while the commercial-industrial-professional market was estimated at 57 percent. Exports accounted for the remaining 13 percent of the total.

Factors Influencing Demand

A growing GNP spells increased employment and income, and as a consequence increased consumer spending. (The GNP increased at an annual average rate of 8.2 percent from 1963 to 1973.) When consumers' disposable income increases more than is required to satisfy basic necessities of food, housing and clothing, more personal discretionary income becomes available for personal recreational expenditures. For 1973, personal recreational expenditures were $52.3 billion.2/ Of this total it is estimated that $3 billion was spent for amateur type photographic equipment, sensitized film and photofinishing.3/

New products are essential in maintaining user interest in photography. The amateur-consumer market is highly responsive to technical innovations which improve the performance, convenience and reliability of moderately priced cameras and accessories. Innovations that offer cost reductions and increased productivity are important to commercial-industrial users as reflected in the high rate of growth of microfilm and photocopying equipment during the 1963-1973 period.

In the amateur-consumer market, price elasticity (price sensitivity) has been a factor affecting demand for equipment, especially cameras. Competitive pricing has helped to increase equipment sales, which in turn increased the demand for accessories, photographic film, paper and chemicals. The fact that

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2/ Statistical Abstract of the United States, U.S. Dept. of Commerce, Bureau of the Census

3/ Dr. Ian Robinson, Arthur D. Little, Inc.

about 78 percent of still cameras purchased at the retail level in 1972 were priced at $50 and under indicates the price range preferred by the amateur-consumer market.4/

Age of the population is another factor influencing demand for amateur-consumer photographic products. The young adult and family-forming age group of 20-34 years historically has created a greater demand for motion picture equipment than other age groups in the population. This group grew at almost double the rate during the decade of the 1960's than the total U.S. population and is projected to represent 29 percent of the population in 1980.5/

Advertising is a means of promoting the introduction of new products and finding new customers. While there are no data showing aggregate advertising expenditures, the photographic industry appears to spend a larger percentage of its domestic sales dollar for advertising than the U.S. industry as a whole. For instance, during the 1968-72 period, Eastman Kodak spent an average of 2.7 percent of its domestic sales on advertising and Polaroid averaged 5.1 percent, while all industry spent an average of 1.4 percent.6/

The growing demand for commercial-industrial photographic equipment is due to the fact that it contributes to greater mechanization and simplification of production and improved communications.

Growth Trends

The value of photographic products shipped during the 1963-1973 decade increased from $1.6 billion to $6.3 billion, which is equivalent to an average annual growth rate of over 14 percent (Table 2).7/ This growth was bolstered largely by photocopying equipment sales and rentals which increased

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4/ Wolfman Report on the Photographic Industry in the United States, 1974-75.

5/ U.S. Bureau of the Census, Population Estimates and Projections, Series P25, No. 601 (Census data covers 18 to 24 years, 25 to 34 years).

6/ Advertising Age, 1972

7/ Shipment data represent value of photographic products reported not only by establishments classified in the photographic industry but also by establishments classified in other industries and shipping these products as secondary products.

Table 2. - Value of Shipments of Photographic Products by Product Class for Selected Years, 1963-73 (in million of dollars)

Product Class	1963	1965	1967	1969	1971	1973	AAGR 1/
Still picture equipment	223.6	340.2	484.8	475.4	400.2	790.8	13.5
Motion picture equipment	127.9	179.4	194.3	180.5	139.6	232.4	6.2
Photocopying equipment	173.6	346.4	620.2	845.0 2/	1,292.0	2/1,864.6	26.8
Microfilm, blueprint, brownprint and white-print equipment	29.3	41.0 2/	53.6	96.4	103.2	172.8	19.4
Equipment Total	554.4	907.0	1,352.9	1,597.3	1,935.0	3,060.6	18.6
Photographic sensitized film and plates	604.9	786.0	1,084.7	1,340.8	1,547.3	1,899.8	12.1
Sensitized photographic paper and cloth, silver halide type	191.3	203.2	238.7	297.1	310.4	450.4	8.9
Sensitized photographic paper and cloth, other than silver halide	128.1	160.2	193.5	219.6	228.0	368.8	11.2
Prepared photographic chemicals	74.3	130.9	148.3	228.7	200.5	323.6	15.9
Supplies Total	998.6	1,280.3	1,665.2	2,086.2	2,286.2	3,042.6	11.8
Photographic equipment and supplies, n.s.k. 3/	78.4	93.7	119.9	114.9	149.9	171.9	8.2
Grand Total	1,631.4	2,281.0	3,138.0	3,798.4	4,371.1	6,275.1	14.4

1/ Average annual growth rate (percent)
2/ Estimated by BDC
3/ n.s.k. (not specified by kind)

Source: U.S. Bureau of the Census, Census of Manufactures, Annual Surveys and BDC.

nearly 27 percent annually, climbing from $174 million to $1,865 million during the decade. This expansion can be credited in part to the fact that the equipment provides the user with savings in labor, pushbutton convenience, speed, and copy quality essential in meeting business needs for cost-effective communications.

The preference for copiers that use plain uncoated paper has been far greater than for those that use treated or coated paper. It is estimated that about 70 percent of total revenues from copiers in 1974 were derived from machines that used plain paper.8/ The majority of the larger, high speed plain paper copiers are leased, while lower-cost coated paper copiers are usually purchased.

Still picture equipment sales grew at an average annual rate of 13.5 percent from 1963 to 1973, attributable to the introduction of new products such as Kodak's Instamatic cartridge-load camera, Polaroid's instant camera and the rotating flashcube, and also to increased personal income and the increase in the 20 to 34 year old age group.

Two important innovations have had an impact on widening the market base; the simplification of camera functions, as exemplified by Polaroid's instant camera and Kodak's Instamatic camera, and the miniaturization of cameras. The fact that U.S. manufacturers concentrated on the production of inexpensive cameras and related equipment also helped. The market for higher priced equipment--the 35mm camera and related equipment, labor intensive products--has been dominated by Japan which has had the advantage of a supply of relatively low-wage labor until recent years.9/

Motion picture equipment sales failed to reach manufacturers' expectations although the annual growth rate averaged 6 percent. The bulk of U.S. production of motion picture equipment consists of the 8mm camera-projector-screen package. Since this is a far more expensive purchase for the amateur consumer than the still camera, it is fair to say that price was among a number of factors, such as the need for editing film, processing costs and a certain degree of artistic skill, that influenced the purchase of motion picture equipment. Supporting the growth in movie equipment was the demand of the family-forming age group of 20-34 years, mentioned

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8/ Richard E. Hanson & Associates, Setauket, L.I., N.Y.
9/ Non-Japanese producers in the Far East are becoming competitive in low-priced equipment.

previously. As the most enthusiastic users of 8mm movie equipment this group is estimated to purchase about 50 percent of the product usually in conjunction with or after the birth of the first child.10/

As for the 16mm camera, considered the standard in commercial-industrial applications, sales since 1965 have been declining in favor of the lower-priced super 8mm system. Production of 35mm-and-over motion picture cameras and projectors, professional studio equipment, increased on the average of 5 percent over the decade.

Of the product group that includes microfilm, blueprint, brownprint, and whiteprint equipment, the microfilm equipment accounted for 82 percent of the total in 1972 and experienced a 24 percent annual rate of growth during the 1963-72 period mainly due to proliferation of printed information and the need for reducing costs associated with information storage and distribution.11/ The most significant industry trend has been the conversion of microfilm from a record-keeping medium to an action-oriented management information system. Instant availability of current data is obtained by high-speed retrieval units for day-to-day business transactions.

Photographic sensitized film and plate sales increased at a 12 percent average annual rate during the 1963-73 period. Demand for film in contrast to that for photographic hardware has been less sensitive to cyclical swings because of a continuing demand for its use in both new and previously purchased equipment. Growth of still picture film can be traced to the demand created by the introduction of inexpensive yet reliable, easy to operate American cameras. One trend that occurred in the amateur-consumer market should be noted. The use of color film continued its upswing and surpassed black and white by a wide margin. Color processing accounted for 94 percent of photofinishing volume at the retail level in 1973 compared to 66 percent in 1963 (excludes Polaroid film).12/ Another trend has been the use of smaller

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10/ Latest developments indicate that sales of movie equipment and film decreased during 1974 and 1975 due to the recessionary period.

11/ U.S. Bureau of the Census, Census of Manufacturers, 1972. Data for individual (seven-digit-products are available only in census years (1963,1967,1972).

12/ Wolfman Report on the Photographic Industry in the United States, 1974-75.

film sizes as a result of emulsion improvement and miniaturization design.

Also there has been a growing preference in the amateur-consumer area for paper prints over slide projection film transparencies. Of the total color pictures taken, 75 percent were processed into paper prints in 1973 compared with 47 percent in 1963.12/ In making still pictures, prints and enlargements the silver-halide type of sensitized photographic paper is used. Growth from 1963 to 1973 averaged nearly 9 percent annually.13/ Processors have also made greater use of resin-coated papers which by inhibiting water absorption can shorten processing time.

Sensitized paper, other than silver-halide, is a diazo, heat-sensitive and zinc oxide treated product used largely in the photocopying market. Sales grew at an average rate of 11 percent annually even though the use of plain paper for copiers increased. The decreased use of sensitized paper for copiers was more than offset by the increased usage of treated papers primarily in reproducing microfilm images.

Prepared photographic chemical sales grew at a 16 percent average annual rate during the 1963-73 period. This growth was supported by the growth of photofinishing and the need for chemicals for processing silver-halide films and other sensitized photographic papers for the consumer and professional markets. The rapidly expanding photocopying market has been the basis for the increased demand for toners and developers. A significant trend has been a reduction in the number of chemicals used in processing photographic films.

13/ Sensitized photographic paper and cloth, silver-halide type includes (SIC 3861611)-designed for continuous-tone reproduction (photofinishing, portraiture, etc.); (SIC 3861615)-designed for line reproduction, graphic arts, etc.; (SIC 3861621)-designed for oscillograph and other types of instrumentation recording processes; (SIC 3861625)-designed for photocopy processes, including diffusion transfer, dye transfer, etc. The 1967 Census provides the following shipment date in millions of dollars: SIC 3861611 = $159.5; SIC 3861615 = $18.0; SIC 3861621 and SIC 3861625 = $61.1. Subsequent Census data combine these categories into one figure.

INDUSTRY STRUCTURE

The photographic industry for the purpose of analysis can be divided into two major subsectors, (1) sensitized material manufacturing and (2) equipment manufacturing.[14]/ The manufacture of sensitized materials is characterized by large capital investment and dominated by a small number of producers. The equipment manufacturing sector is labor intensive and is composed of hundreds of producers. Many of the large producers of sensitized materials are also the major manufacturers of equipment and have been leaders in the industry's growth. They have acquired the technologies and skills that have enabled them to become the largest producers of cameras and accessories and other photographic products including micrographic, photocomposition and photocopying equipment. Table 3 lists major U.S. producers, their sales of photographic products and types of products produced in 1973.

Industry Concentration

The industry is characterized by a high degree of concentration amongst a relatively few producers. The eight largest companies, while representing only 5 percent of the number of establishments in 1967, accounted for 81 percent of the total value of shipments, 71 percent of total employment, 68 percent of total production workers, 88 percent of new capital expenditures and 85 percent of the value added by manufacturing.[15]/ The next largest 42 companies accounted for 14 percent of the total value of shipments so that 50 out of 505 companies supplied 95 percent of the value of shipments in 1967 (Table 4). (Comparison of concentration ratios of the eight largest companies in selected allied industries are shown in Appendix Table 18)

14/ Sensitized material consist of photographic film, paper and plates.

15/ Bureau of the Census, 1967 Census of Manufactures, SR2-68, Concentration Ratios. Data from the 1972 Census of Manufactures indicate that 4 companies accounted for 75 percent of total industry shipments in 1972 as compared to 69 percent in 1967. Additional 1972 industry concentration data are not yet available (June 1976).

TABLE 3. - Estimated Sales of Photographic Products in the United States by Selected Major U.S. Producers, 1973

Company	Estimated U.S. photographic sales 1/ (million dollars)	Percent of U.S. sales	Production product-mix		
			Sensitized Materials	Equipment	Photo Chemicals
Eastman Kodak Co.	1,760 2/	29	X	X	X
Xerox Corporation	1,630	26	--	X	X
3M Company	500	8	X	X	X
Polaroid Corp.	480	8	X	X	--
DuPont Company	430	7	X	--	X
GAF Corporation	260	4	X	X	X
Bell & Howell	175	3	X	X	--
All other companies	940	15			
Total	6,175	100			

1/ Estimates are based on corporate annual reports

2/ Estimate supplied by Dr. Ian Robinson, Arthur D. Little, Inc.

Table 4. - Photographic Industry:
Concentration Ratios,
1963 and 1967

Item		Unit	Quantity	Number of companies 4	8	20	50
				(percent of quantity)			
Number of establishments,	1967	each	557	2	5	10	17
	1963		538	2	5	9	16
Value of shipments,	1967	$million	3,664.5	69	81	89	95
	1963		1,851.2	63	76	86	93
Value added by manufacture,	1967	$million	2,480.7	75	85	86	96
	1963		1,270.1	69	81	89	94
Capital expenditures,	1967	$million	217.9	82	88	93	98
	1963		78.6	80	87	91	95
All employees,	1967	000's	94.9	55	71	83	92
	1963		64.9	56	68	81	90
Production workers,	1967	000's	56.2	48	68	79	90
	1963		39.2	52	66	78	88

Source: U.S. Department of Commerce, Bureau of the Census, Concentration Ratios in Manufacturing Industries, 1963 and 1967.

The highest degree of concentration, however, was in sensitized materials; photographic film, plates and sensitized paper. In this category the eight largest companies accounted for 98 percent of the total value of shipments in 1967. These major companies, as innovator producers in the industry, were able to capture a sizeable portion of the market. The companies continued to improve on their inventions, broadened their market base by developing new products and incorporated new technologies and promotional methods.

Long lead time required for construction and break-in of a complex facility for the production of sensitized photographic materials makes entry into this field difficult for the small producer. The smaller manufacturers have therefore concentrated primarily in the hardware area which is more labor intensive than other segments of the industry. The major companies by continuing to commit large expenditures to R & D have maintained their technological leadership16/.

Company and Establishments Profile

In the 1963-72 period, the photographic industry increased by 55 new companies, from 499 in 1963 to 554 companies in 1972. The number of establishments in 1963 grew from 538 plants to 623 in 1972, an increase of 16 percent which was substantially higher than for all manufacturing establishments, as is shown by the following data in Table 5. The growth in the number of establishments by geographic region is shown in Table 7.

Table 5.--Number of Establishments in the Photographic Industry and All Manufacturing for Selected Years, 1963-72

Year	Photographic Industry 1/ Establishments		All Manufacturing 2/ Establishments (000's)	
	Total	With 20 employees or more	Total	With 20 employees or more
1963	538	187	307	99
1967	557	214	306	107
1972	623	221	313	110
Percent Increase	16%	18%	2%	11%

1/ U.S. Bureau of the Census, 1972 Census of Manufactures
2/ Ibid, 1972 General Summary

16/ See section on Research and Development

Product Diversification

While most major U.S. manufacturers of photographic products produce a wide range of photographic items which helps reduce distribution costs, many have also entered other industrial fields.

These companies have been utilizing their technological skills and research facilities to diversify in other product areas of possible greater growth potentials. As shown in Table 6, diversification has been rather extensive, covering products such as industrial chemicals, electronics, textile fibers, plastics, floor covering materials, vitamins, food additives and health care items.

Geographic Distribution of Shipments, Establishments and Employment

Shipments of the photographic industry in 1972 originated primarily in six northeastern states. This section of the country accounted for 80 percent of the industry's total value of shipments, 39 percent of the industry's establishments and 73 percent of total employment in 1972 (Figure 1). Located in this region are the major manufacturing facilities of Eastman Kodak, Xerox, Polaroid and GAF. The north central section accounted for 10 percent of the value of shipments, 25 percent of the establishments and 15 percent of employment. The 3M Company and Bell & Howell are major producers in this area. The western and southern sections of the country are characterized by small to medium-size companies. It is of interest to note that the western section, while accounting for only 6 percent of the total value of industry shipments, represented 25 percent of the total number of establishments.[17]/

A distribution of establishments and value of shipments by the four U.S. regions for 1963 and 1972 is given in Table 7.

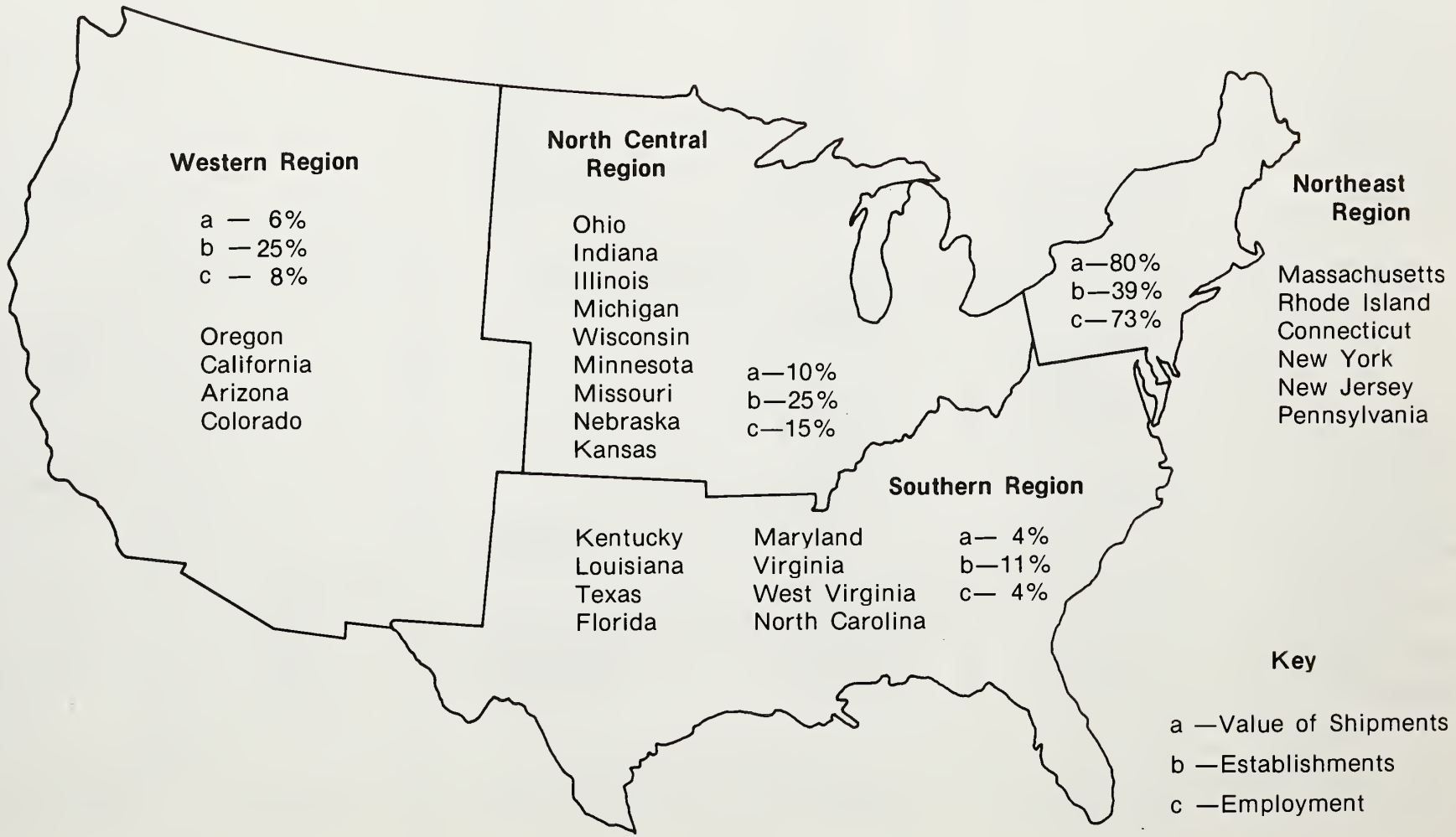
17/ Future shipments from Eastman Kodak's new Windsor Colorado plant will increase the value of industry shipments from the western region, 1974 annual report.

Table 6. - Photographic Products and Other Activities of Selected Firms, 1973

Eastman Kodak	Polaroid	Bell & Howell	GAF Corp.	Berkey Photo.	The 3M Co.
Photographic Products					
Cameras	Cameras	Projectors	Projectors	Cameras	Projectors
Projectors	Photo film	Microfilm equipment	Microfilm equipment	Projectors	Photo film
Photo film	Other photo apparatus	Audio-visual systems	Audio-visual systems	Lighting equipment	Photo paper
Photo paper			Photo film	Graphic Arts equipment	Photo-chemicals
Processing equipment		Imported cameras	Photo paper	Photo-finishing	Photo-finishing
Photo-chemicals			Photo-chemicals	Other photo apparatus	Microfilm equipment
Microfilm equipment			Photo-copying equipment	Imported cameras, lenses & other apparatus	Photo-copying equipment
Audio-visual systems			Photo-finishing		
Photo-finishing			Imported cameras		
Other photo apparatus & accessories					
Other Activities					
Chemicals	Sunglasses	Optics	Chemicals (industrial)	Calculators	Chemicals-industrial
Textile fibers		Duplicating equipment	Business forms	Photo-retail stores	Abrasives
Floorcovering materials		Instrumentation	Building-materials		Adhesives
Plastic resins & film		Learning-systems	Synthetic fibers		Electronics
Waxes & dyes		Business equipment	Sound control products		Advertising services
Vitamins & food additives		Career training schools	Pigments		Health-care products
			Photo-retail stores		Magnetic tape
					Pressure-sensitive tape

Source: Corporate Annual Reports

Figure 1. Photographic industry: Value of shipments, establishments and employment as percentages by geographic area, 1972



Source: U.S. Bureau of the Census, 1972 Census of Manufactures.

Table 7. - Number of Establishments and Value of Shipments of the Photographic Industry by U.S. Regions, 1963 and 1972

U.S. Regions	1963 Establishment (number)	1963 Value of shipments ($Million)	1972 Establishment (number)	1972 Value of shipments ($Million)
United States	538	1,851.2	623	5,579.4
Northeast	240	1,448.1	243	4,450.4
North Central	149	302.5	258	591.8
South	37	23.8	67	216.1
West	112	76.8	155	321.1

Source: U.S. Bureau of Census, 1963 and 1972 Census of Manufactures.

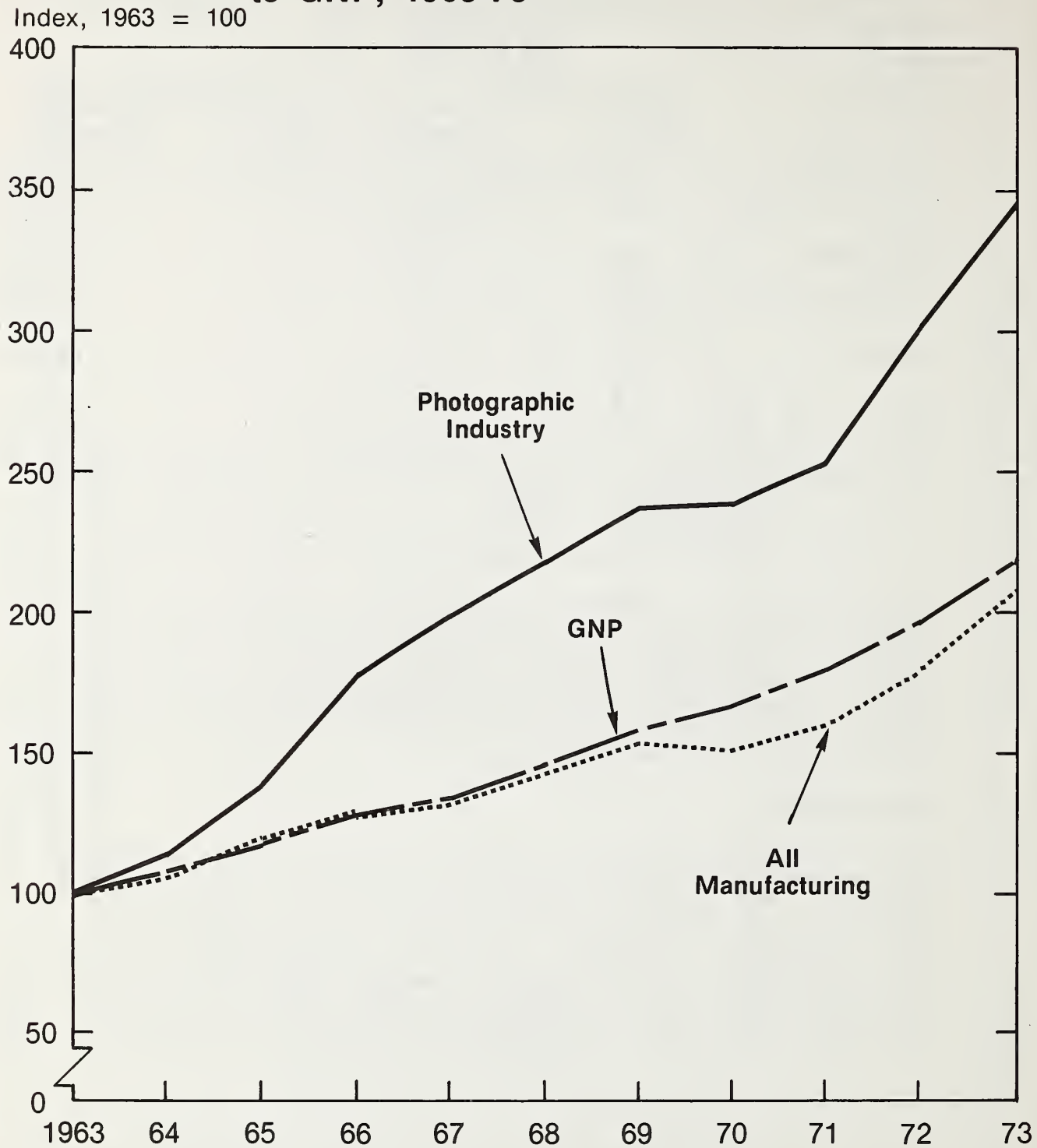
GROWTH IN EMPLOYMENT, EXPENDITURES AND PRODUCTIVITY

The photographic industry recorded considerable growth during the 1963-1973 decade and outpaced the growth in the GNP by a substantial margin, (Figure 2). The value of shipments increased 13 percent on an annual average over the period compared to GNP's 8 percent annual increase. The labor force was enlarged and the level of capital expenditures was raised substantially.

Employment

Total employment rose by 55 percent from 65,000 to 101,000. The number of production workers, however, increased by 49 percent. The number of nonproduction workers, including administrative, marketing, engineering and research personnel, increased 65 percent. The ratio of production workers to total employment averaged 59 percent during the period. This was well below the ratio for other industries in the same major two-digit group, SIC (38) and for All Manufac-

Figure 2. Value of shipments of the photographic industry and of all manufacturing compared to GNP, 1963-73



Source: Bureau of the Census, Census of Manufactures and Annual Surveys.

turing.[18]/ This low ratio can be attributed largely to the high degree of mechanization and automation in the manufacturing of photographic software, the sector representing 49 percent of the total photographic output. The high percentage of nonproduction workers suggests a comparatively large number of personnel in marketing, engineering and research. The data in Table 8 illustrates the industry's growth in employment, payroll, value of shipments, cost of materials and capital expenditures.

Expenditures

The industry's costs of materials for each dollar of product shipment declined from 31 cents in 1963 to 28 cents in 1973. The decline in face of rising material costs can be credited to the industry's adoption of cost-cutting practices such as substituting less expensive materials, e.g., plastics for metal parts and glass lenses, using less silver halide per unit area of photographic film and simplifying production techniques by replacing labor intensive mechanical parts with electronic circuitry.

Encouraged by the growing economy and increased purchasing power, the industry programmed large outlays for plant and equipment. From a low level of spending, $46 million in 1964, capital expenditure increased almost five-fold to $218 million by 1967 and then plateaued, fluctuating moderately yet averaging over $200 million through 1972. The industry's capital expenditures for 1963-73 compared to All Manufacturing are illustrated in Figure 3.

Spending for research and development was also strongly supported. Many new and improved products were developed which continued to stimulate demand so that sales increased annually throughout the 11-year period.

Payroll as related to value of shipments declined from 27 cents per dollar of shipments in 1963 to 19 cents per dollar of shipments in 1973. This decline in payroll cost of sales can be attributed to increased mechanization which led to greater efficiency and required fewer workers to produce more

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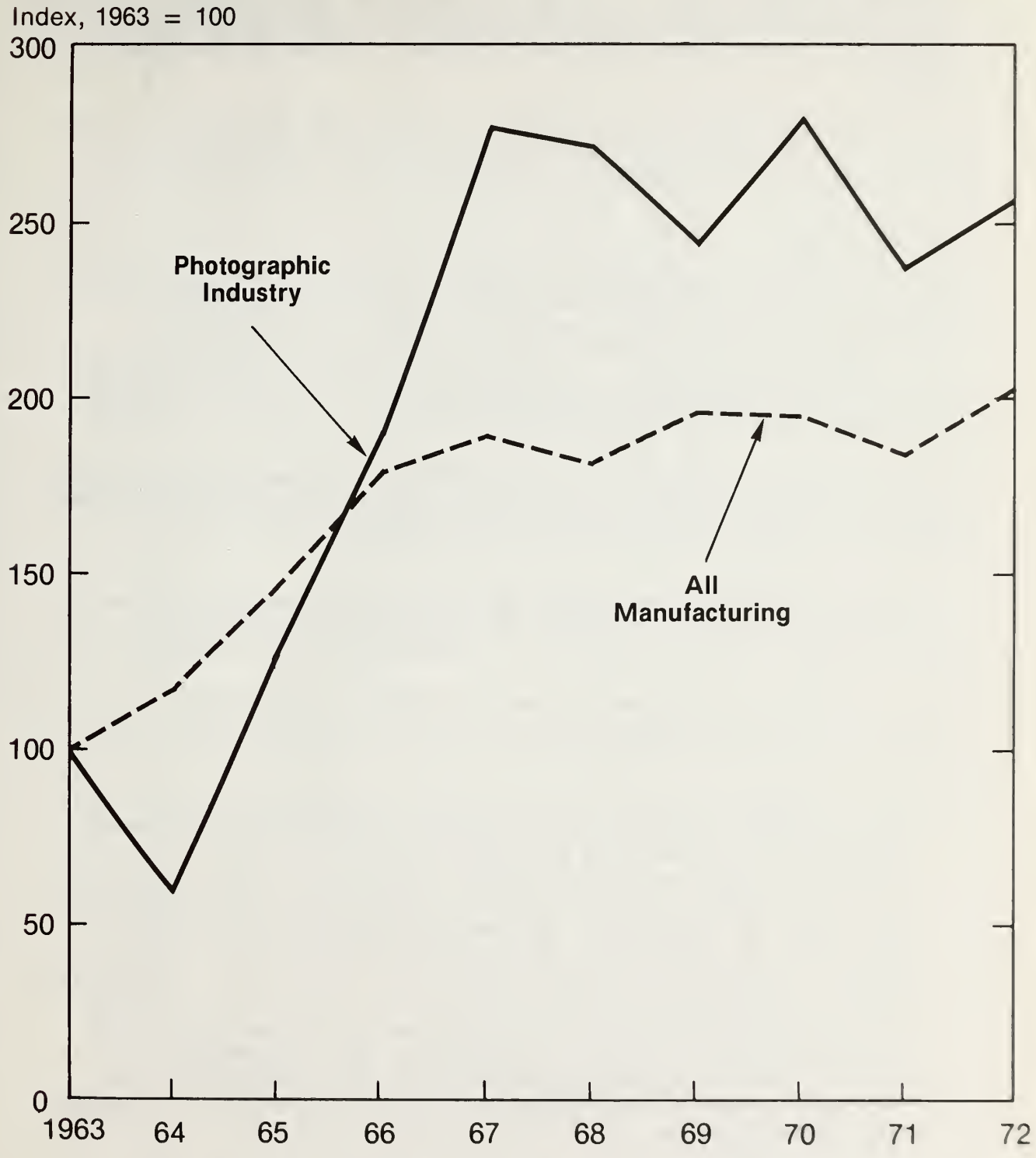
18/ The ratio of production workers to total employment for the major group SIC (38) industries for the comparable period averaged 73% for Surgical & Medical Instruments; 68% for Surgical Appliances & Supplies; 70% for Dental Equipment & Supplies; 80% for Ophthalmic Goods; and 71% for All Manufacturing; 1972 Census of Manufactures.

Table 8. - Photographic Industry; General Characteristics, 1963-73

Year	Employment: Total (thousand)	Employment: Production workers (thousand)	Total Payroll ($ mil)	Production worker Wages ($ mil)	Production worker man hours (million)	Value of 1/ Shipments ($ mil)	Cost of Materials ($ mil)	Capital Expenditures ($ mil)
1963	65	39	499	252	78	1,851	581	79
1964	67	41	533	272	82	2,091	632	46
1965	71	45	600	314	92	2,553	826	99
1966	84	55	711	377	109	3,286	1,100	148
1967	95	56	820	401	112	3,665	1,203	218
1968	92	52	833	395	103	4,009	1,314	213
1969	96	55	937	433	107	4,375	1,372	192
1970	93	51	953	431	97	4,414	1,268	220
1971	88	49	954	436	88	4,710	1,224	187
1972	95	55	1,108	541	105	5,579	1,453	202
1973	101	58	1,235	595	111	6,435	1,821	(NA)
Average Annual Growth Rate (percent)								
1963-67	10.0	9.5	13.2	12.3	9.5	18.6	20.0	29.0
1967-73	1.0	0.6	7.1	6.8	-0.2	9.8	7.2	n.a.
1963-73	4.5	4.0	9.5	9.0	3.6	13.3	12.1	n.a.

1/ Includes secondary products shipped by companies classified in the photographic industry.
Source: U.S. Bureau of the Census, Census of Manufactures and Annual Surveys

Figure 3. Capital expenditures of the photographic industry and of all manufacturing, 1963-72



Source: Bureau of the Census, Census of Manufactures and Annual Surveys.

units of product. Since growth was primarily in units produced rather than in price increases, (as will be discussed below) the increased value of shipments, or greater output per dollar of payroll was a "real" rather than an inflationary growth.

An important factor to consider is that the increased output per unit of labor input was large enough to outweigh the added cost of the increased nonproduction worker payroll.

Productivity

The photographic industry realized increased productivity during 1963-73. Whether measured in terms of payroll, production worker wages, manhours, value of shipments or value added by manufacture, the increase in productivity was of a substantial nature. The data in Table 9 documents the productivity aspects by relating payroll, value of shipments and values added by manufacture.

Cost of payroll per dollar of shipments, as mentioned above, dropped from 27 cents to 19 cents; or stated percentage-wise, payroll in 1973 was reduced to 1.9 percent of the value of shipments compared to 2.7 percent in 1963.

In terms of production worker output the industry's value of shipments increased from $47,461 per worker in 1963 to $110,948 per worker in 1973, an increase of 134 percent.

Productivity as measured by value added by manufacture increased at an average annual rate of 14 percent.19/ The

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19 Value added, considered a reliable measure for comparing the relative economic importance of manufacturing among industries, is derived by subtracting the total cost of materials (including materials, supplies, fuel, electric energy, cost of resales and miscellaneous receipts) from the value of shipments (including resales) and other receipts and adjusting the resulting amount by the net change in finished products and work-in-process inventories between the beginning and end of the year. Value added avoids the duplication in the value of shipments figure which results from the inclusion of the shipments of establishments producing materials and components (raw materials, parts and components) along with the shipments of establishments producing finished products.

Table 9. - Photographic Industry: Selected Operating Ratios and Value Added Data, 1963-73

Year	Payroll per employee (dollars)	Production workers to total employment (percent)	Cost of materials per dollar shipments (dollars)	Cost of payrolls per dollar shipments (dollars)	Value of shipments per production worker (dollars)	Value added by manufacture (million dollars)	Value added per man-hour of production worker (dollars)
1963	7,682	60	.31	.27	47,461	1,270.1	16.34
1964	7,998	62	.30	.26	51,000	1,485.5	18.17
1965	8,504	64	.32	.24	56,733	1,773.2	19.30
1966	8,436	66	.33	.22	59,745	2,282.0	20.90
1967	8,649	59	.33	.22	65,446	2,480.7	22.19
1968	9,103	57	.33	.21	77,096	2,663.9	25.91
1969	9,771	57	.31	.22	79,545	3,020.1	28.30
1970	10,298	56	.29	.21	86,549	3,187.3	32.89
1971	10,815	56	.26	.20	96,122	3,488.0	39.77
1972	11,703	58	.26	.20	101,436	4,081.0	38.76
1973	12,219	58	.28	.19	110,948	4,735.6	42.78
Average Annual Growth Rate (percent)							
1963-70	3.0	-0.4	1.6	-5.0	8.4	18.2	8.0
1967-73	5.9	-0.3	-3.2	-2.5	9.2	11.4	11.6
1963-73	4.7	-0.4	-1.0	-3.5	8.9	14.1	10.1

Source: U.S. Bureau of the Census, Census of Manufactures and Annual Surveys

value added per production worker man hour for the industry increased from $16 to over $42 in the 11 years, an average annual increase of 10 percent or an overall increase of 162 percent.[20]/ (Figures 4 & 5 illustrate the value added data presented in Table 9.)

The Inflationary Factor

Inflation had a minimum effect on the prices of photographic products up to 1974. The increase in the wholesale price index for photographic equipment and supplies averaged 1.4 percent annually during the 1967-73 period compared to 4.4 percent increase for consumer finished goods and 3.9 percent increase for all industrial commodities[21]/ (Figure 6). Not only was severe price competition in the photographic industry a compelling factor in holding the line on prices, but a degree of price elasticity in the demand for photographic equipment also helped to deter price increases.

During 1974, however, wholesale prices of photographic products turned sharply upward. The wholesale price index increased almost 8 percent from 1973 to 1974; but this was considerably less than the 16 percent increase for consumer finished goods and the 22 percent increase in the wholesale price index for all industrial commodities.

RESEARCH AND DEVELOPMENT

The development and promotion of new and improved products have been decisive in maintaining growth of the photographic industry. The industry has emphasized research and development to keep new designs and products flowing into the market place. This has been necessary for several reasons. Aside from cameras and film, photographic products are not mass market items. In addition, photographic products including cameras have limited market life cycles and many have shown peak marketability in periods of less than 5 years. Some innovations have produced photographic techniques that have been basic to the development of new processes and technolo-

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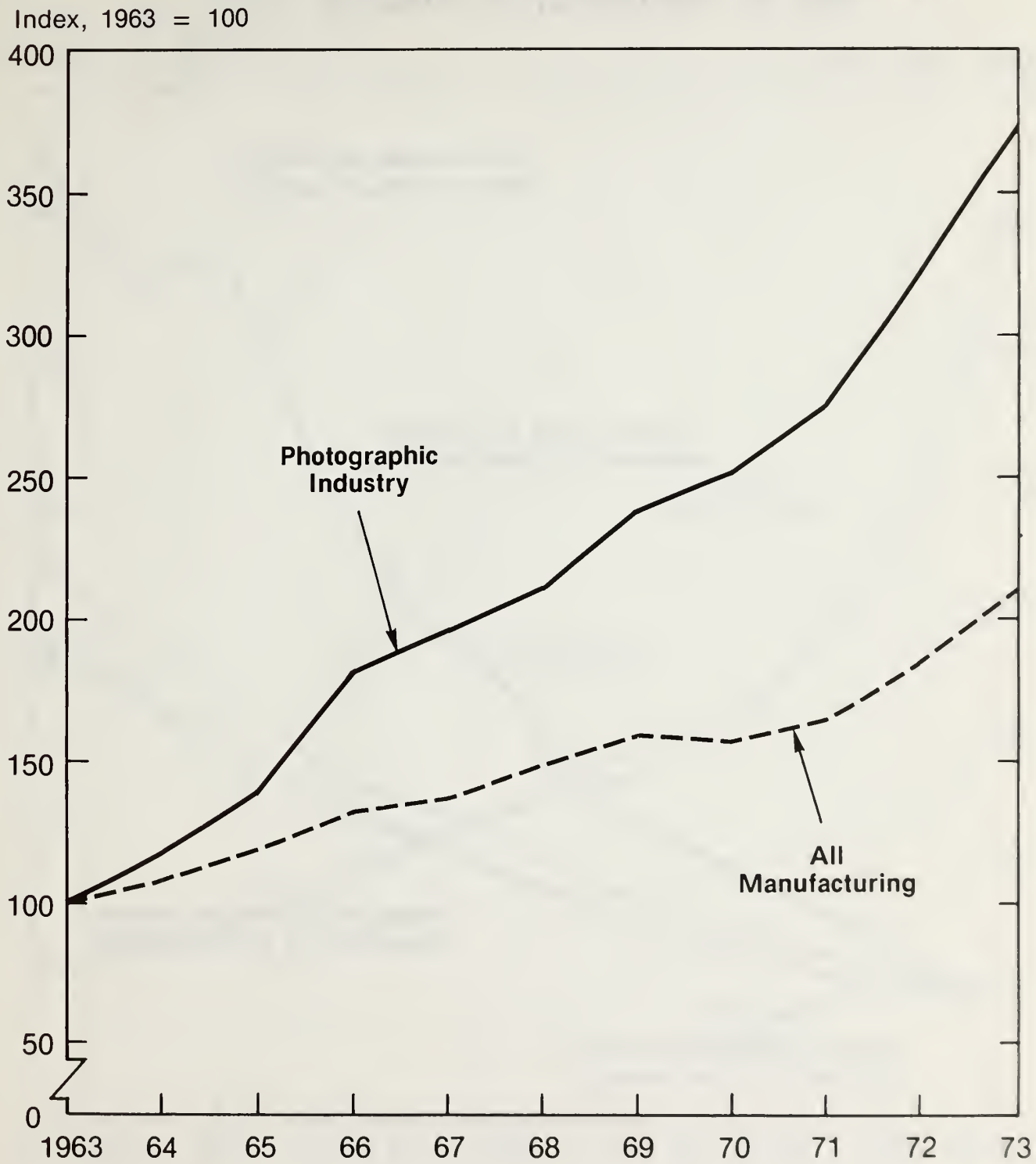
20/In comparison, value added for All Manufacturing increased at an average annual rate of approximately 8 percent; value added per production worker man hour increased at an annual rate of about 6 percent or an overall increase of 84 percent.

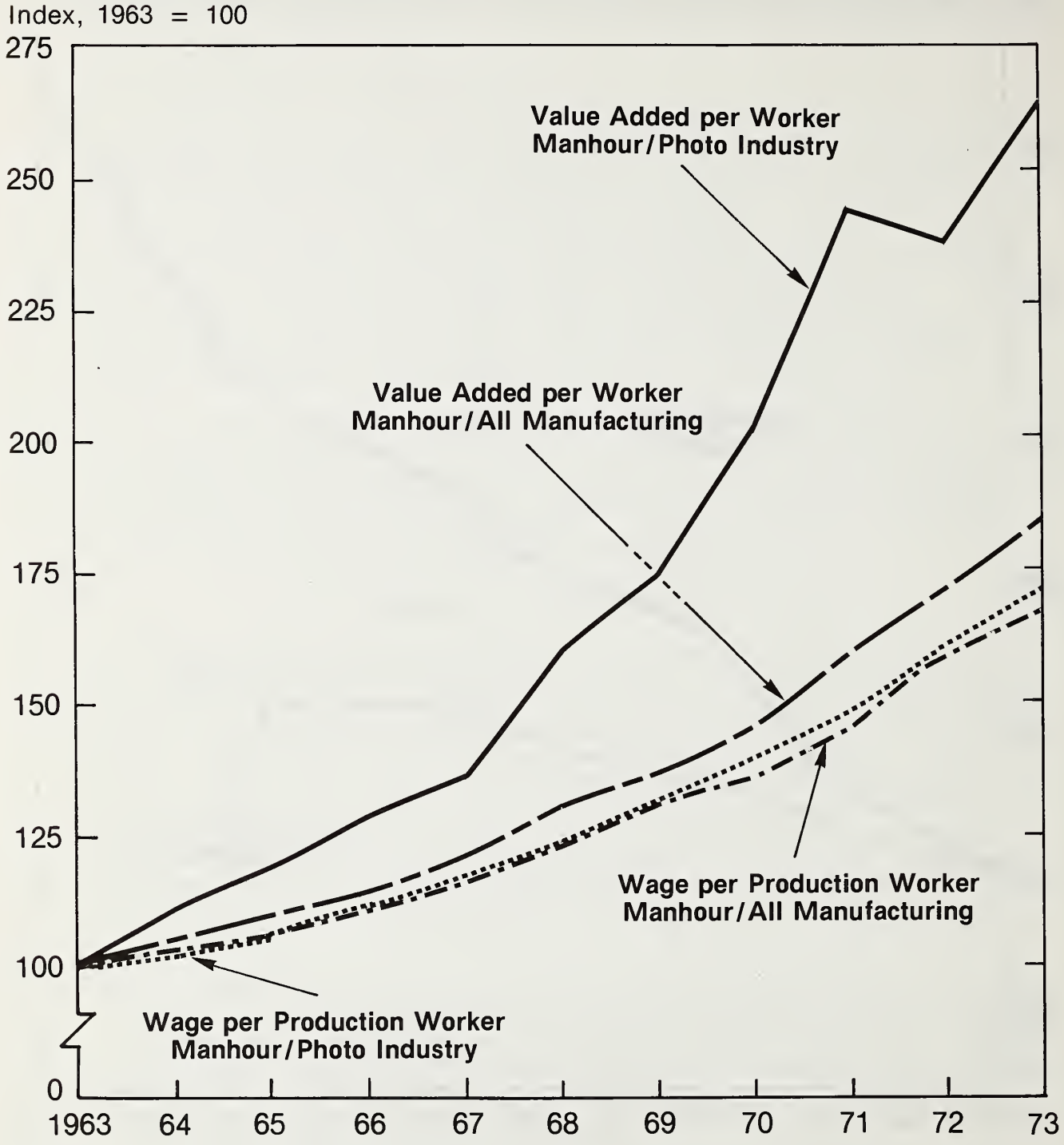
21/Bureau of Labor Statistics. See Table 19 in Appendix for selected wholesale price indexes.

Figure 4. Value added by manufacture—photographic industry and all manufacturing, 1963-73



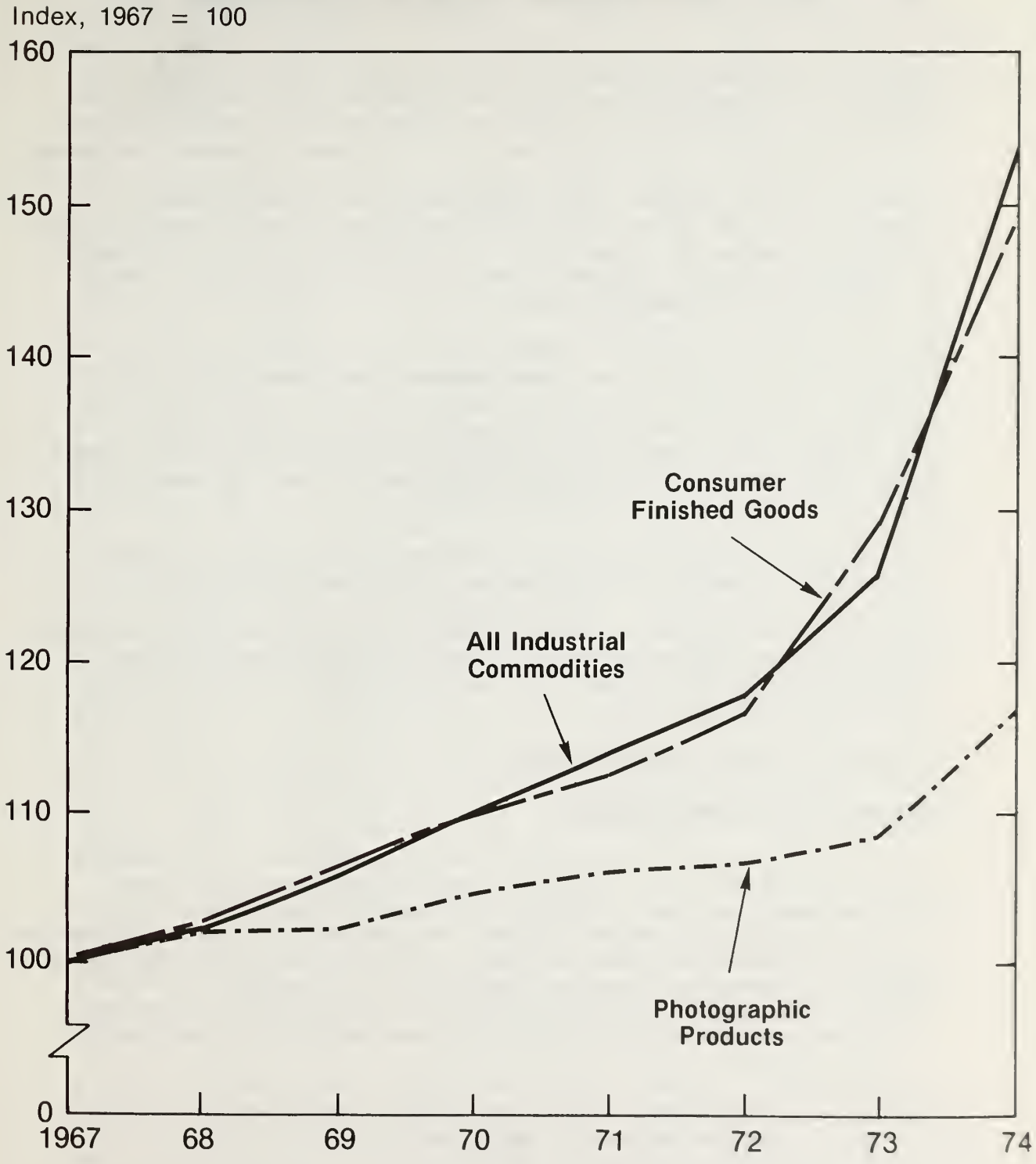
Source: Bureau of the Census, Census of Manufactures and Annual Surveys

Figure 5. Wages and value added by manufacture per production worker for the photographic industry and all manufacturing, 1963-73



Source: U.S. Bureau of the Census, Census of Manufactures and Annual Surveys.

Figure 6. Comparison of selected wholesale price indexes, 1967-75



Source: U.S. Department of Labor, Wholesale Prices and Price Indexes.

gies while others have been adopted by various industries to replace their more expensive mechanical operations.22/

Basic research in the photographic industry involves interfacing principles of optics, light-waves, electronics and chemistry. Examples of current programs are: exploring new light sensitive materials to reduce or eliminate silver in photographic film emulsions without sacrificing the speed and sensitivity of silver; acoustic-optical research; plastic powders for coatings; electrophotography; transmission characteristics of color dyes; transfer of color images from electronic tape to film; and holography, a process by which a recorded pattern on photographic material can be viewed as a three-dimensional image.

Applied research in the photographic industry has been successful in adding many new marketable products. For example, about 246 different camera models were available in 1974 to meet diverse photographic applications.23/ Every model or design of any type of photographic equipment that is developed for the marketplace is the outcome of a compromise between performance and cost.

Increasingly important is the recent development of the "systems" concept of integrating equipment to perform a series of functions. Micrographics is a good example. It involves the use of cameras, film processing units, storage and retrieval systems, duplicators, readers and reader printers so as to enable the user to monitor and control a complete operation.

Major Technical Developments

Hardware Equipment Sector

In the still picture equipment area, numerous innovations were introduced to stimulate both amateur-consumer and professional demand. Kodak's Instamatic cartridge-load line of cameras by simplifying the operation greatly expanded public interest in photography. This was followed by Kodak's "pocket" Instamatic camera and spin-off demands for projectors, accessories and processing equipment. Polaroid's "instant" camera which provided in-camera film processing

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22/ Expenditures for R&D by Selected Companies for 1970-74 are shown in Appendix Table 20.

23/ Wolfman Report, 1974-75.

was well received by both the amateur-consumer and professional market. The Polaroid has found professional applications in identification systems, graphic arts, reproduction, and in medicine and science where the benefits of having an immediate picture is advantageous for evaluation and diagnosis. Polaroid's SX-70 "instant" compact camera incorporated new concepts in optics, electronics, mechanics and chemistry.

Many innovations in flash-apparatus, beginning with the "rotating flashcube," expanded film sales by increasing the convenience of indoor picture taking. This was followed by the "magicube," a mechanical triggering flash which eliminated electrical failure; the "FlashBar 10" which fired ten lamps sequentially without replacing the flashbar; and the electronic flash which fired up to 100 flash shots per set of non-rechargeable batteries.

Major technical advances in processing and finishing equipment resulted in greater output and lower labor costs, improved quality control and reduction in chemicals used. The rate of processing film negatives increased from about 300 rolls per hour in 1963, to 1,000 rolls per hour by 1972. Computers made possible operatorless printing of negatives at 6,000 prints per hour, ten times the rate in 1963.

In the motion picture equipment area, Kodak was one of the major innovators. Its Super 8mm movie system substantially improved the quality of motion pictures and enlarged the picture size by 50 percent. Later Kodak introduced the "available-light" movie film and camera which eliminated the need for artificial lighting equipment, the "Supermatic" film videoplayer which allows video display of movie film over a television system; and the "Ektasound" movie camera which offers the dimension of sound recorded directly in the camera.

While basic microfilm technology was well established prior to 1963, the industry has since then developed cameras capable of high reduction ratios, automated retrieval systems, and low-cost readers and printers capable of producing readable copies of micro-images. Computer-output-microfilm recorders were introduced for the purpose of converting digitized computer output onto microfilm at speeds twenty times faster than the commonly used impact printers. Basically, this equipment combines electronics, photo-optics, and electro-mechanical techniques; it may also employ cathode ray tubes, light emitting diodes or electron and laser beams.

As with microfilm technology, photocopying was utilized extensively prior to 1963. However, in 1964 Xerox introduced its transfer photoelectrostatic process that produced copies on plain rather than on coated paper directly from an original document at the rate of 2400 an hour. This equipment made a significant impact on office system reproduction, since other copiers were slower and used diazo, thermal or zinc oxide coated papers. From 1964 to 1973 further developments were introduced in plain paper copiers which offered higher speeds and convenience and ease of operation.

Phototypesetting, the method of producing columns or an entire page of text in a single operation from a master photographic negative, has replaced hot metal linotype and monotype machines in the majority of commercial as well as in newspaper establishments. With the introduction of phototypesetting technology it became economically feasible to use computers to automate the process, to hyphenate words, control margins and form layouts.

Photofabrication, an off-shoot of the graphic arts industry that utilizes photoetching methods rather than cutting tools, has revolutionized the field of electronics. The need for a feasible and inexpensive method of producing miniaturized electronic circuitry and components has established photofabrication as an indispensible tool in the manufacturing of printed circuit boards at a cost substantially below that for handwired circuits. More significantly, this photographic technique together with micrographics have enabled the electronic industry to develop the initial integrated circuits and most recently the microprocessor and computer on tiny silicon chips. These chips can run a complex calculator, control an elevator, a set of traffic lights, a microwave oven, a gas pump or a complex scientific instrument such as a gas chromatograph. A masterdrawing of a very complex circuit, usually 500 times as large as the actual chip, is first reduced photographically to micro-miniature size and the image is then photographically transferred to the chip. The reverberations of the little chip of silicon having the brainpower of a digital computer will most certainly affect all sectors of the economy in the production, distribution and consumption of goods and services.

Software Sector

Research involving photographic film emulsion technology in the development of higher performance imaging materials has accompanied advances in equipment design. Interaction of research and demand has contributed to development of superior

color film, smaller film formats and higher performance films for commercial-industrial applications.

A new film, slow enough in speed to produce image sharpness and less grain under 3X magnification in producing prints from 35mm-size negatives was developed for the Instamatic cameras in 1963. A 16mm-size film was developed for Kodak's "pocket" camera, which was four times smaller than the Instamatic negatives, yet capable of producing large dimensional quality prints. Kodak's Ektachrome 160 high-speed color film made it possible to take motion pictures under dim lighting conditions.

Polaroid's "instant" cameras required an entirely new concept in film technology since the negatives were developed within the camera. Diffusion transfer technology was used to diffuse the developing liquid into the negative layer, develop the picture, and at the same time remove from it the unexposed grains which were reduced to metallic silver on the surface of the positive sheet. The film for Polaroid's SX-70 camera consists of an integral structure of 17 chemical layers.

Photographic films for the professional, commercial and industrial market require qualities more critical than those produced for the amateur-consumer market. Accordingly, manufacturers have introduced improved light sensitive silver halide emulsions based on the use of small-to-medium sized crystals that inherently are less grainy and which scatter light to a lesser degree. This produces photographic films for use in instrumentation, lithographic printing and microfilm systems which render maximum image detail, high density, minimum grain and high resolution. Deep-etched and silver sensitized plates are being replaced by less costly photopolymer coated plates for medium-to-high volume printing runs. X-ray screens have been developed for low-dose radiation, and the films are sensitized on both sides for increased speed and contrast.

Technical advances in sensitized papers and chemicals have resulted in increased processing output. Resin-coated papers have been developed with fast emulsions to speed-up enlarging time and have a relatively waterproof base for high speed processing that minimizes the absorption of processing solutions. Prepared photo-chemicals were improved to increase processing output. A reduction in the number of processing steps requiring less chemical consumption has resulted in higher production speed.

U.S. COMPETITIVE POSITION IN WORLD PRODUCTION AND TRADE

Total World Production 1963-73

The value of world production of photographic equipment and supplies has grown impressively during the 1963-73 period, as shown in Table 10, rising from an estimated figure of $2.9 billion in 1963 to $11.7 billion in 1973--an average annual growth rate of 15 percent.[24]/ This growth was due mainly to the general economic expansion and improved living standards attained in most of the countries of the western world and in Japan.

In 1973, the United States together with Japan and the countries of the European Economic Community (EEC) provided over 80 percent of the photographic products manufactured in the world.[25]/ Other important producers were Switzerland, Austria, Norway, Sweden, Canada and Australia. Hong Kong, Singapore and Taiwan entered the world market as important producers of equipment about 1967.

The photographic industries of the communist countries also have been growing in importance. East Germany and the U.S.S.R. are the leading producers, followed by Czechoslovakia, Bulgaria, Hungary, Poland and China. Since their domestic markets for photographic products are relatively small, these countries have emphasized foreign trade, especially in the form of exports from East Germany, the U.S.S.R., and Czechoslovakia.

The United States has continued to dominate the world production of photographic products. Its share of world production, however, declined from 56 percent in 1963 to 54 percent in 1973, although U.S. production more than tripled during the period. This decline has coincided with the increased production of the other countries of the world as shown in Table 10.

24/ Data are in durrent dollars reflecting the inflation during the period. No attempt was made to deflate into constant dollars because of the difficulties in dealing with currencies and price changes in many countries.

25/ The EEC countries are: Belgium, Luxemburg, Denmark, France, West Germany, Italy, Netherlands, United Kingdom, and Ireland.

Table 10. - ESTIMATED WORLD PRODUCTION OF PHOTOGRAPHIC PRODUCTS FOR SELECTED YEARS, 1963-73
(in millions of dollars)

Country	1963		1967		1973	
	Value	Percent of total	Value	Percent of total	Value	Percent of total
United States	1,631	56	3,138	56	6,275	54
Japan	288	10	550	10	1,350	11
West Germany	305	10	381	7	760	7
United Kingdom	160	6	280	5	500	4
France	94	3	125	2	255	2
Belgium	77	3	120	2	250	2
Italy	70	2	95	2	190	2
Other Non-communist countries	50	2	200	4	390	3
Communist countries	230	8	675	12	1,700	15
World total	2,905	100	5,564	100	11,670	100

Source: Based on official country statistics where available, industry sources and estimates from BDC

Japan, during this period, had become the second largest world producer by surpassing West Germany's production by a wide margin. Japan's success in winning a large share of the American photographic market has been due in part to innovative and energetic marketing. The Japanese photographic industry developed effective sales campaigns, established sales subsidiaries staffed with American personnel, (Cannon, USA, Fuji Photo Films USA, Minolta Corporation, Chinon Corporation of America, etc.) designed reliable and competitively priced camera equipment and sold through growing chains of discount stores as well as to independent photographic dealers.

U.S. Foreign Subsidiaries

International sales of overseas subsidiaries have become important to the growth of the U.S. photographic industry. It is estimated that international sales were 25 percent of total U.S. industry sales in 1973 and are expected to increase.26/ Per capita spending on photographic products in England, France and Germany has been approximately one-third of that in the United States and only one-sixth in such other markets as Italy and Spain.27/ According to the major producers in the industry there appears to be a potential for growth in foreign markets, especially in the commercial and industrial areas, since photographic production in foreign countries has been geared more to the amateur-consumer market. Only lately has there been recognition abroad of the importance of modern photographic techniques such as microfilming, photocopying, photofabrication and photocomposition.

Overseas subsidiaries are usually established for a number of reasons: (1) to increase the size of corporate sales and world market share, (2) to achieve more effective marketing, since subsidiaries are more familiar with local customs and product preferences, (3) to provide the consumer with access to supplies and technical services within the country, (4) to surmount tariff barriers in a protected national market, and (5) because subsidiaries by conforming to the laws and customs of the foreign countries are generally looked upon as local companies rather than U.S. subsidiaries, and thus enjoy the consumer's confidence. The foreign country, in its trade statistics, usually includes a subsidiary's exports in its export totals.

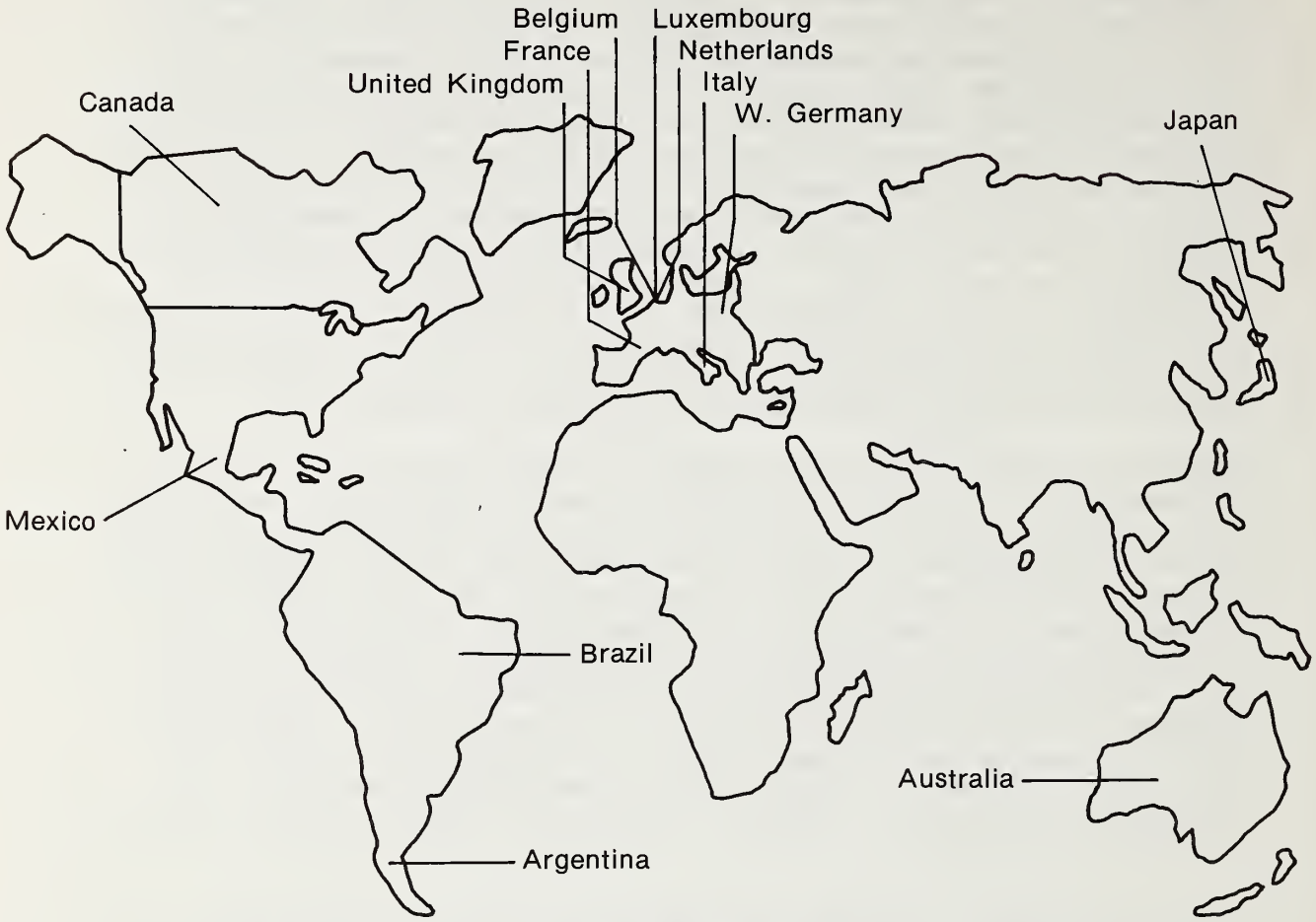
In the European Economic Community, because of non-discriminatory tariffs, a subsidiary may specialize on a particular product line in one country, and by so doing can take advantage of the economies of scale and continue to trade in all member countries under the favorable tariff arrangement.

A geographic distribution of major U.S. foreign manufacturing subsidiaries throughout the world is presented in Figure 7. Several facts in relation to these data are significant: (1)

26/ Corporate reports indicate that sales of Kodak's overseas subsidiaries in 1973 were 39 percent of total corporate sales, while Xerox realized about 40 percent of its revenue from international operations.

27/ Eastman Kodak, 1972 Annual Report.

Figure 7. Geographic distribution of major U.S. foreign manufacturing subsidiaries



Location of U.S. Foreign Subsidiaries by Company

Company	Country
Eastman Kodak Co.	Canada, U.K., France, W. Germany Mexico, Brazil, Argentina, Australia
Xerox Corp.	U.K., Canada, Brazil
DuPont Co.	W. Germany, Luxembourg
Polaroid Corp.	U.K., Netherlands
Bell & Howell	Japan, W. Germany
3M Company	Italy
GAF Corp.	Belgium

Source: Based on corporate annual reports.

more than half of the major U.S. manufacturing subsidiaries are located in the developed countries of Europe; (2) increased interest is being shown in lesser developed countries such as Mexico, Brazil, Argentina and Australia; and (3) Kodak has the most extensive worldwide network of manufacturing subsidiaries.

Several major U.S. producers have research laboratories overseas, and in many foreign markets where U.S. manufacturing facilities do not exist maintain marketing distribution and service facilities.

Major World Producers

The major world manufacturers of photographic equipment and supplies are located in the more developed countries of the world (Table 11). Of the 15 major world producers listed in the table, excluding the "All other producers" category, U.S. companies accounted for 75 percent of the world sales in 1973. Seven of these firms, Kodak, Agfa-Gevaert, 3M, Polaroid, Fuji Photo Film, GAF and Konishiroku manufacture both equipment and film. They have the opportunity, therefore, to improve their competitive positions through lower marketing and distribution costs that result from having large inventories of varied photographic products and recurring sales of film.

U.S. Foreign Trade

Expanding world markets and favorable exchange rates in the late 1960's and early 1970's enabled U.S. exports of photographic products to grow at an annual rate of 19 percent between 1963 and 1974 to reach $1.1 billion, almost a 7-fold increase over the $161 million of exports in 1963. In 1975, during the recession world-wide, exports increased approximately $1 million, or about one-tenth of one percent, (Table 12).

The United States has continued to be the major exporter of photographic products. However, in the 1967-1973 period its share of world exports declined from 29 percent to 24 percent due mainly to increased production of the other developed countries.28/ Inasmuch as the home markets in these producing countries are relatively small, producers are required

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28/ United Nations Market Share Reports, 1973. Later data are not available as of this date (Jan. 1976).

Table 11. - Major World Producers of Photographic Products, 1973

Company and Country	Estimated World Photographic Sales 1/ (in millions of dollars)	Percent of Total World Sales
Eastman Kodak Co. (U.S.)	3,320 2/	28
Xerox Corp. (U.S.)	2,542	21
Afga-Gevaert (Germany-Belgium)	831	7
3M Company (U.S.)	764	6
Polaroid Corp. (U.S.)	666	6
Fuji Photo Film (Japan)	406	3
VEB Film Fabrik (East Germany)	400	3
DuPont Company (U.S.)	424	4
Rank Organisation (England)	445	4
GAF Corporation (U.S.)	298	2
Canon, Inc. (Japan)	200	2
Bell & Howell (U.S.)	200	2
Konishiroku Photo (Japan)	192	2
Ciba-Geigy (Switzerland)	140	1
Robert Bosch Photokino (W. Germany)	115	1
All other producers	1,021	8
Total	11,964	100

1/ Kodak's sales include photofinishing services as may the sales of some of the other companies.

2/ Estimate supplied by Dr. Ian Robinson, Arthur D. Little, Inc.

Source: Estimated from corporation annual reports

Table 12. - U.S. SHIPMENTS OF PHOTOGRAPHIC PRODUCTS AND FOREIGN TRADE, 1963-75
(in millions of dollars)

Year	Shipments: Industry 1/	Shipments: Photographic Products	Exports	Imports	Trade Balance	Apparent 2/ Consumption	Exports as % of Production	Imports as % of Consumption
1963	1,851	1,631	161	91	70	1,561	9.9	5.8
1964	2,091	1,906	190	112	78	1,828	9.9	6.1
1965	2,553	2,296	237	119	118	2,178	10.3	5.5
1966	3,286	2,831	295	136	159	2,672	10.4	5.1
1967	3,665	3,138	325	145	180	2,958	10.4	4.9
1968	4,009	3,531	365	184	181	3,350	10.3	5.5
1969	4,375	3,798	397	218	179	3,619	10.5	6.0
1970	4,414	3,888	447	254	193	3,695	11.5	6.9
1971	4,710	4,371	505	303	202	4,169	11.6	7.3
1972	5,579	5,255	618	387	231	5,024	11.8	7.7
1973	6,435	6,275	805	470	335	5,940	12.8	7.9
1974	n.a.	n.a.	1,106	532	574	n.a.	n.a.	n.a.
1975	n.a.	n.a.	1,107	580	527	n.a.	n.a.	n.a.

n.a. not available

1/ Includes secondary products shipped by companies classified in the photographic industry.

2/ Consumption as used in this study means apparent consumption in manufacturers' prices which equals domestic shipments minus exports plus imports. (Importers markup not included)

Source: Tables 2, 8 and U.S. Bureau of the Census, Foreign Trade Statistics

to seek markets elsewhere. While the U.S. exported only 13 percent of its photographic production, Europe and Japan exported as much as 50 percent and more of their production.29/

United States exported to 143 countries in 1974; but 9 countries -- Canada, Japan, West Germany, Netherlands, United Kingdom, Italy, France, Brazil and Mexico -- accounted for 67 percent of total exports in 1974 and 65 percent in 1975 (Table 13). Although Canada, historically, has been the largest single country customer for photographic products, Europe represented the largest export market. Asia, however, registered the greatest rise in its imports from the U.S. during 1963-75, an average increase of 21 percent annually, due primarily to the accelerated exports to Japan (Table 14).

As an importer, the United States has provided the largest market to the world's photographic product exporters. It was estimated that in 1974, with only 6 percent of the world's population the U.S. would consume 49 percent of the world's photographic sales.30/

From 1963 to 1975 imports grew at an annual rate of 16.7 percent from $91 million to $580 million, (Table 17). Most of the growth can be attributed to the penetration of the still picture market by inexpensive cameras and accessories from low wage countries such as Hong Kong, Taiwan and the Korean Republic and by high-value 35mm. cameras which are not manufactured in the U.S. Nine countries -- Japan, West Germany, Belgium-Luxemburg, United Kingdom, Canada, Hong Kong, France, Italy and Switzerland -- accounted for 92.5 percent of U.S. imports in 1975, but Japan was the leading foreign supplier, accounting for over 59 percent of the total, (Table 15).

U.S. exports of photographic products by product category, i.e., (1) cameras, other equipment and parts, (2) photographic films and plates, (3) photographic papers, and (4) photographic chemicals are shown in Table 16 for selected years 1963-75. Exports of cameras, other equipment and parts, which grew from $71.8 million in 1963 to $398.5 million in 1973

29/ Ibid. Some country data include processed film (motion pictures) and other items not comparable to U.S. data.

30/ An address, "Photography European Style" given in Chicago to the Photo Marketing Association by Dr. Erich Lindeman, Vice Chairman, Board of Management, Agfa Gevaert, 1973.

represented 49.5 percent of the total exports and 13 percent of the country's production of these products. The category increased to $515.6 million, representing 46.6 percent of total exports in 1975. The annual average export growth for the 1963-75 period was approximately 18 percent. The other 3 categories are similarly presented in Table 16.

Imports by product category for selected years, 1963-75, are shown in Table 17. The 5-fold increase from $90.9 million, for total imports in 1963 to $470.3 million in 1973 was heavily weighted in favor of cameras, other equipment and parts, which increased from 53 percent of total imports in 1963 to about 71 percent in 1973 and represented 11 percent of U.S. consumption. Imports of photographic films, plates and photographic papers, on the other hand, dropped from about 46 percent of the total imports in 1963 to about 29 percent in 1973. In dollar value, however, this category grew from $42 million to approximately $135 million, representing 10 percent of U.S. consumption. In 1975 imports reached $580 million. Imports of the camera and other equipment category increased to $385 million and represented 66.4 percent of total imports, while the sensitized materials increased to $189 million or 32.6 percent of the total.

Exports of photographic products exceeded imports by increasing margins during the 1963-75 period due chiefly to the aggressive performance of photographic film, paper and chemicals and the strong demand for photocopying, microfilming and other reproduction equipment. The $70 million favorable trade balance in 1963 grew to a $574 million surplus in 1974 and decreased to $527 million in 1975, a 7-fold increase over 1963 (Figure 8). In comparison, the total U.S. merchandise trade balance declined. From a trade surplus of $6.8 billion in 1964 ($5.2 billion in 1963), the trade balance declined during the 1960's. In 1974 the U.S. had a merchandise trade deficit of $3.7 billion but recovered in 1975 with a trade surplus of $9.5 billion.31/

It is expected that shipments of photographic products from developed and developing countries will increase. The industry, however, looks forward to a larger export market and to a continuing favorable trade balance for photographic products.

31/ U.S. Bureau of Economic Analysis, Department of Commerce, Survey of Current Business, June 1974, March 1975, March 1976.

Table 13. - Value of U.S. Exports by Major Country of Destination for Selected Years, 1963-75
(in millions of dollars)

Country	1963		1967		1972		1974		1975	
	Value	Percent share	Value	Percent share	Value	Percent share	Value	Percent share	Value	Percent share
Canada	27.7	17.2	70.2	21.6	101.9	16.5	164.9	14.9	171.8	15.5
Japan	13.2	8.2	24.7	7.6	53.4	8.6	122.0	11.0	112.3	10.1
West Germany	10.2	6.3	24.4	7.5	68.0	11.0	96.0	8.7	113.6	10.3
Netherlands	3.4	2.1	8.9	2.7	37.9	6.1	94.5	8.5	55.5	5.0
United Kingdom	11.7	7.3	26.2	8.1	51.9	8.4	87.2	7.9	93.9	8.5
Brazil	2.8	1.7	8.4	2.6	23.5	3.8	47.3	4.3	38.6	3.5
France	8.1	5.0	14.5	4.5	24.2	3.9	45.1	4.1	42.1	3.8
Italy	4.7	2.9	11.3	3.5	29.5	4.8	44.7	4.0	49.0	4.4
Mexico	9.1	5.7	16.1	5.0	25.4	4.1	37.6	3.4	41.6	3.8
Other	70.1	43.5	120.3	37.0	202.3	32.7	366.7	33.2	388.6	35.1
Total	161.0	100.0	325.0	100.0	618.0	100.0	1,106.0	100.0	1,107.0	100.0

Source: U.S. Bureau of the Census, Foreign Trade Statistics

Table 14 - U.S. Exports of Photographic Products By World Geographic Areas, for Selected Years, 1967-75
(in thousands of dollars)

Area	1967 1/	Percent share	1970 1/	Percent share	1973 1/	Percent share	1975 1/	Percent share	AAGR 2/
North America	91,148	29	99,341	23	161,947	21	225,811	21	12.0
South America & Caribbean	26,839	9	41,333	10	67,639	9	91,688	9	16.6
Europe	135,525	42	191,689	44	382,471	48	504,628	47	17.9
Asia	42,019	13	73,467	17	133,230	17	187,794	17	21.0
Australia & Oceania	11,529	4	14,863	3	25,720	3	42,773	4	17.8
Africa	8,388	3	13,238	3	18,337	2	28,063	2	16.3
Total	$315,448	100	$433,931	100	$789,344	100	1,080,757	100	

1/ Totals exclude photo lamps and three classified camera categories for which the value exported in these categories to specific countries are not disclosed.
2/ Average annual growth rate (percent)
Source: National Association of Photographic Manufacturers, Inc., based on U.S. Bureau of the Census Foreign Trade Statistics

Table 15. - Value of U.S. Imports by Major Country of Origin for Selected Years, 1963-75
(in millions of dollars)

Country	1963		1967		1972		1974		1975	
	Value	Percent share	Value	Percent share	Value	Percent share	Value	Percent share	Value	Percent share
Japan	25.6	28.1	63.7	43.9	219.0	56.6	259.5	48.8	344.2	59.3
West Germany	26.2	28.8	26.3	18.1	50.4	13.0	51.5	9.7	54.8	9.4
Belgium, Luxemburg	20.8	22.9	24.7	17.0	30.1	7.8	41.0	7.7	44.4	7.7
United Kingdom	7.0	7.7	11.3	7.8	32.5	8.4	26.6	5.0	25.5	4.4
Canada	1.5	1.6	1.8	1.2	18.5	4.8	25.1	4.7	29.8	5.1
Hong Kong	0.1	0.1	1.7	1.2	5.8	1.5	12.9	2.4	10.4	1.8
France	1.6	1.8	4.5	3.1	5.1	1.3	3.7	0.7	4.3	0.7
Italy	2.2	2.4	4.9	3.4	9.5	2.5	8.7	1.6	15.1	2.6
Switzerland	3.2	3.5	3.3	2.3	4.6	1.2	6.2	1.2	7.9	1.4
Other	2.8	3.1	2.8	1.9	11.5	3.0	96.8	18.2	43.6	7.5
Total	91.0	100.0	145.0	100.0	387.0	100.0	532.0	100.0	580.0	100.0

Source: U.S. Bureau of the Census, Foreign Trade Statistics

Table 16. - U.S. Exports of Photographic Products by Product Category and Percent of U.S. Production for Selected Years, 1963-75

Product category	1963 Export $000's	1963 Percent share	1963 Percent U.S. production	1967 Export $000's	1967 Percent share	1967 Percent U.S. production	1973 Export $000's	1973 Percent share	1973 Percent U.S. production	1975 1/ Exports $000's	1975 1/ Percent share	AAGR 2/ 1963-75
Cameras, other equipment & parts	71,784	44.5	12.1	150,291	47.4	11.2	398,532	49.5	13.0	515,587	46.6	17.9
Photographic films & plates	66,140	41.0	10.6	127,824	38.4	11.5	282,607	35.1	14.9	419,067	37.8	16.6
Photographic papers	20,847	12.9	6.4	34,612	10.4	7.5	88,211	11.0	10.6	114,392	10.3	15.2
Photographic chemicals	2,570	1.6	3.5	12,753	3.8	8.6	35,700	4.4	11.0	58,202	5.3	30.0
Totals	161,341	100.0	9.9	325,480	100.0	10.6	805,050	100.0	12.8	1,107,248	100.0	17.4

1/ Production data for 1975 cannot be computed because production data (shipments) are not available.

2/ Average Annual Growth Rate (percent)

Source: U.S. Bureau of the Census, Foreign Trade Statistics

Table 17. - U.S. Imports of Photographic Products by Product Category and Percent of U.S. Consumption for Selected Years, 1963-75

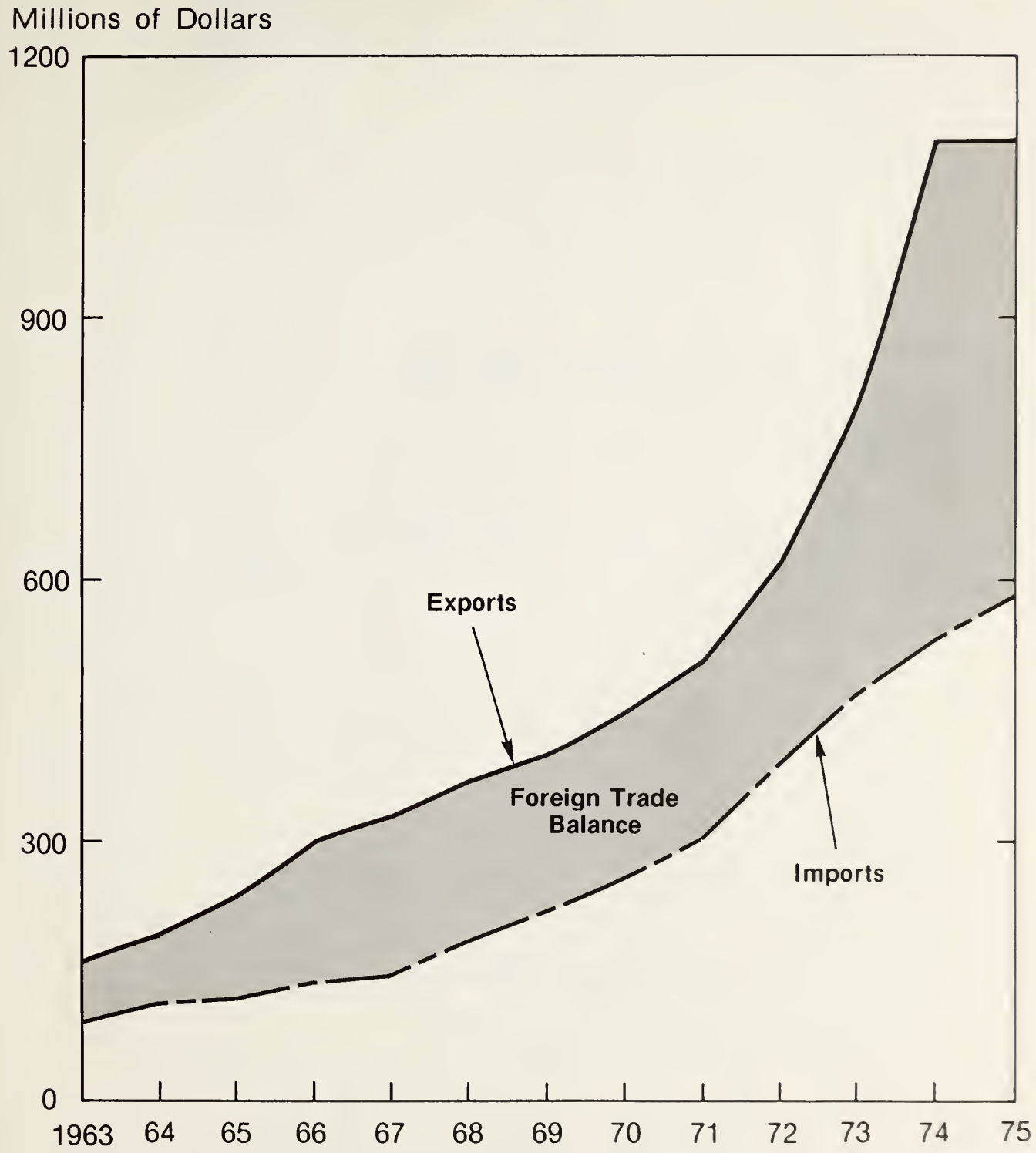
Product category	1963 Imports $000's	1963 Percent share	1963 Percent U.S. consumption	1967 Imports $000's	1967 Percent share	1967 Percent U.S. consumption	1973 Imports $000's	1973 Percent share	1973 Percent U.S. consumption	1975 1/ Imports $000's	1975 1/ Percent share	AAGR 2/ 1963-75
Cameras, other equipment & parts	48,528	53.4	8.4	95,799	64.8	7.1	333,411	70.9	11.1	385,156	66.4	18.8
Photographic films & plates	24,344	26.8	4.1	37,410	25.4	3.6	103,745	22.1	6.0	134,657	23.2	15.3
Photographic papers	17,834	19.6	5.6	11,309	9.6	3.2	30,713	6.5	4.0	54,525	9.4	9.7
Photographic chemicals	162	0.2	0.2	245	0.2	0.2	2,445	0.5	0.8	5,445	1.0	34.0
Totals	90,868	100.0	5.8	144,763	100.0	5.0	470,314	100.0	7.9	579,783	100.0	16.7

1/ Consumption data for 1975 cannot be computed because production data (shipments) are not available. See Table 12, footnote (2).

2/ Average Annual Growth Rate (percent)

Source: U.S. Bureau of the Census, Foreign Trade Statistics

Figure 8. Growth trends of U.S. imports and exports of photographic products and foreign trade balance, 1963-75



Source: Table 12.

A P P E N D I X

Table 18. - COMPARISON OF CONCENTRATION RATIOS OF THE EIGHT LARGEST COMPANIES IN SELECTED INDUSTRIES, 1963 and 1967

(in percentages)

ITEM (Percent of)	Year	Photo-graphic Industry 3861	Surgical & medical instruments 3841	Optical Instruments & Lenses 3831	Engineering & Scientific Instruments 3811	Electronic Computing Equipment 3573	Semi-conductors 3674
Number of establishments	1963	5	7	5	2	13	16
	1967	5	8	6	3	21	12
Value of Shipments	1963	76	58	53	40	80	65
	1967	81	54	59	38	85	65
Value added by manufacture	1963	81	57	52	44	77	65
	1967	85	52	59	38	83	65
Capital expenditures	1963	87	75	52	47	(D)	76
	1967	88	57	40	26	75	63
All employees	1963	68	51	51	38	73	63
	1967	71	48	55	33	70	63
Production workers	1963	66	50	46	34	72	61
	1967	68	48	48	33	61	60

(D) Withheld to avoid disclosing figures for individual companies

Source: U.S. Bureau of the Census, 1963 & 1967 Census of Manufactures, SR 2 Concentration Ratios

Table 19. - SELECTED WHOLESALE PRICE INDEXES, 1967-74

Year	Photographic Equipment & Supplies	Games and Toys	Computers & Related Machines	Home Electronic Equipment	Electronic Components & Accessories	All Industrial Commodities
1967	100.0	100.0	100.0	100.0	100.0	100.0
1968	102.2	103.4	100.7	98.1	99.2	102.5
1969	102.4	105.2	101.0	94.6	100.7	106.0
1970	104.9	110.0	103.5	93.3	101.0	110.0
1971	106.1	112.9	105.4	93.8	103.0	114.0
1972	106.7	115.4	106.5	92.7	103.4	117.9
1973	108.4	118.4	108.2	91.9	104.4	125.9
AAPC 1/	1.4	2.9	1.3	-1.5	0.7	3.9
1974	116.8	137.1	113.5	93.1	111.4	153.8
AAPC 2/	2.2	4.6	1.8	-1.01	1.6	6.4

1/ Average annual percentage change for 1967-1973

2/ " " " " " 1967-1974

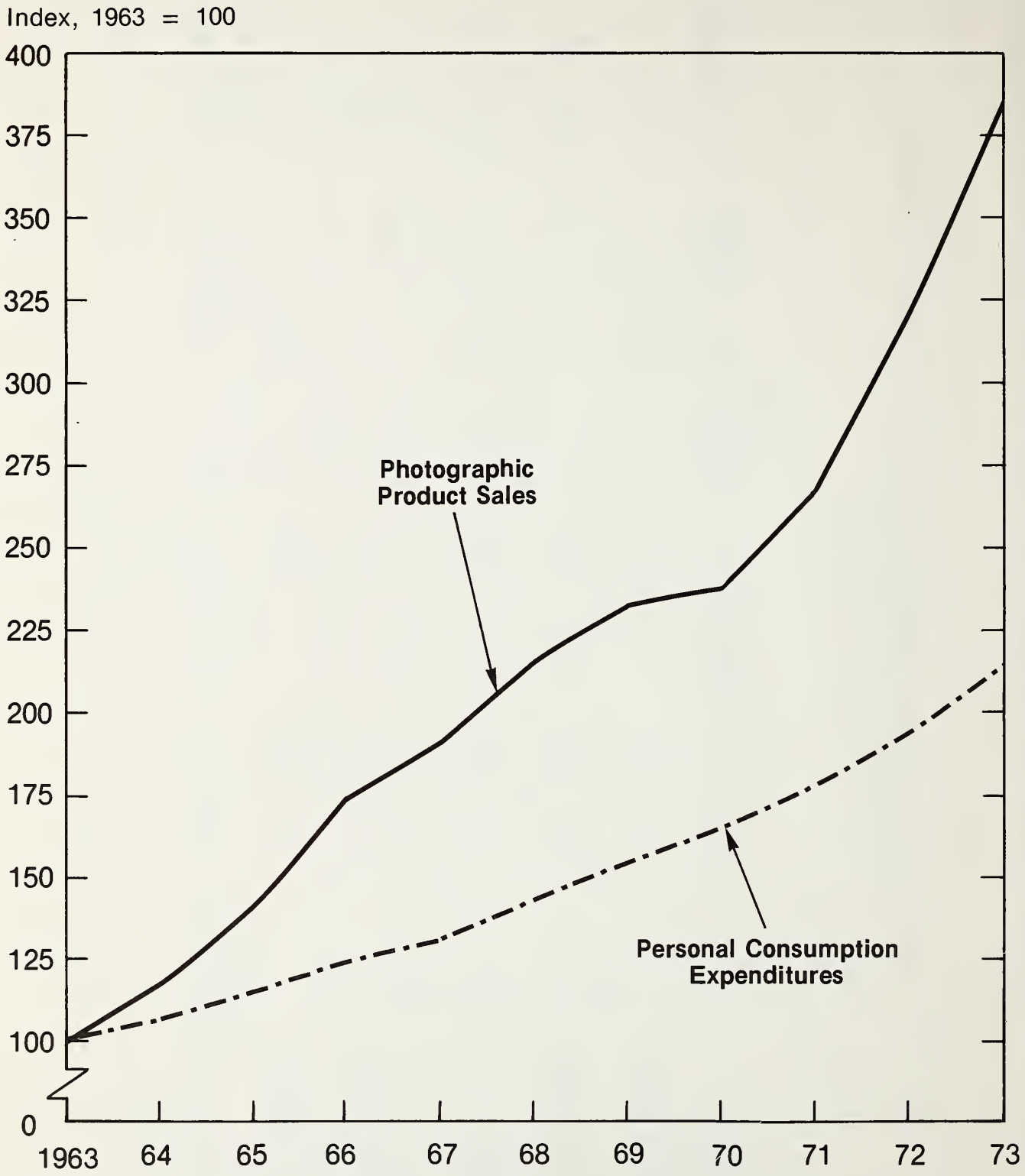
Source: Bureau of Labor Statistics, Wholesale Prices, and Price Indexes

Table 20. - Photographic Industry: Research and Development Expenditures of Selected Companies, 1970-74
(in millions of dollars)

Company	1970	1971	Percent Change	1972	Percent Change	1973	Percent Change	1974	Percent Change
Eastman Kodak	171	180	5.3	215	19.4	248	15.3	274	10.5
Percent of Sales	6.1	6.0		6.2		6.1		6.0	
Xerox Corporation	98	104	6.1	132	26.9	167	26.5	197	18.0
Percent of Sales	5.7	5.3		5.5		5.6		5.5	
3M Company	82	86	4.9	95	10.5	114	20.0	132	15.8
Percent of Sales	4.9	4.7		4.5		4.5		4.5	
GAF Corporation	13	13	0.0	14	7.7	14	0.0	16	14.3
Percent of Sales	2.2	1.8		1.8		1.7		1.7	
Du Pont Company	n.a.	250	-	255	2.0	276	8.2	344	24.6
Percent of Sales		5.7		5.2		4.6		5.0	
Bell & Howell Company	21	19	-9.6	23	21.0	24	4.3	23	-4.2
Percent of Sales	6.6	5.9		6.3		6.1		5.0	

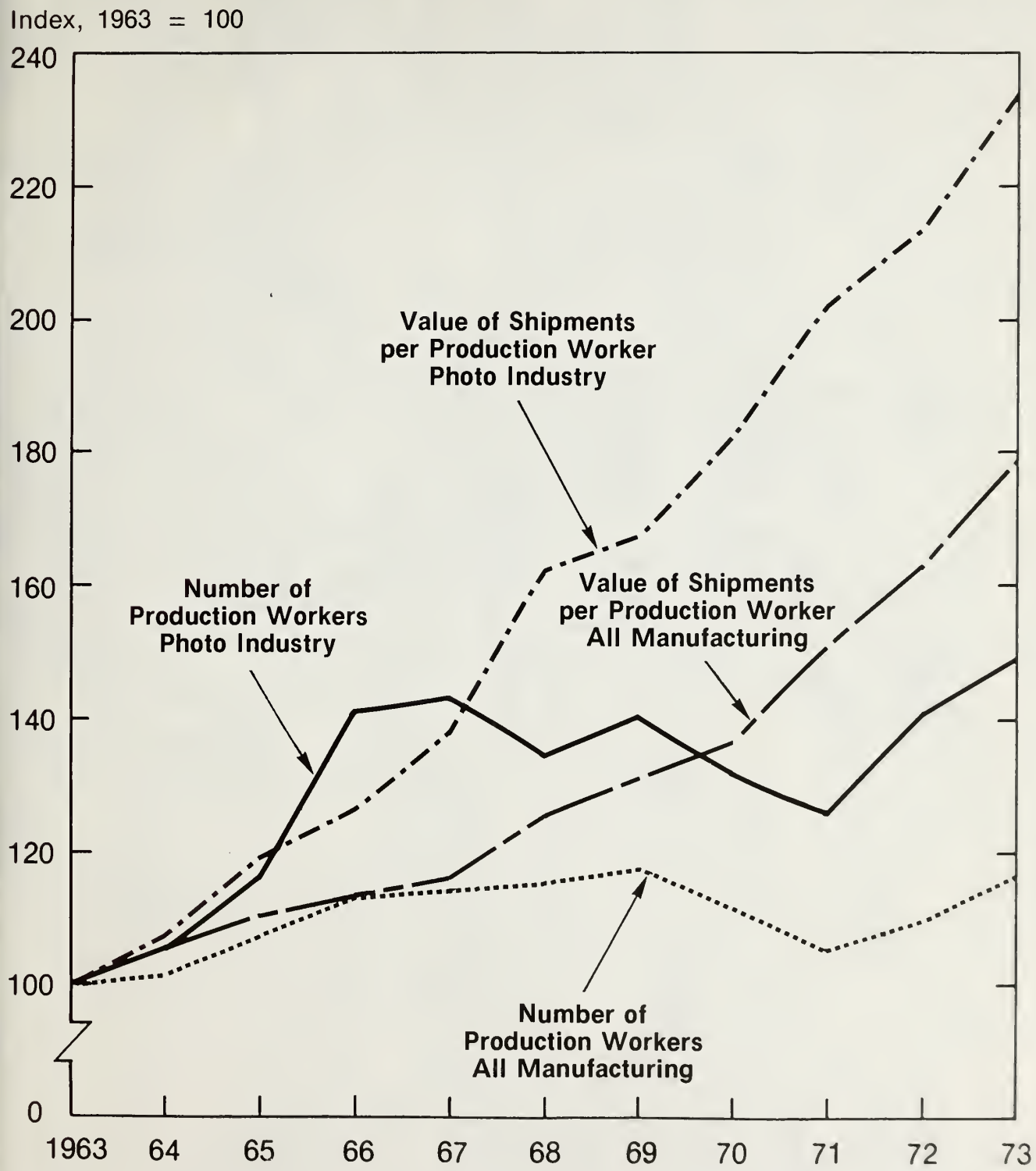
Source: Corporate annual reports

Figure 9. Photographic product sales compared to personal consumption expenditures, 1963-73



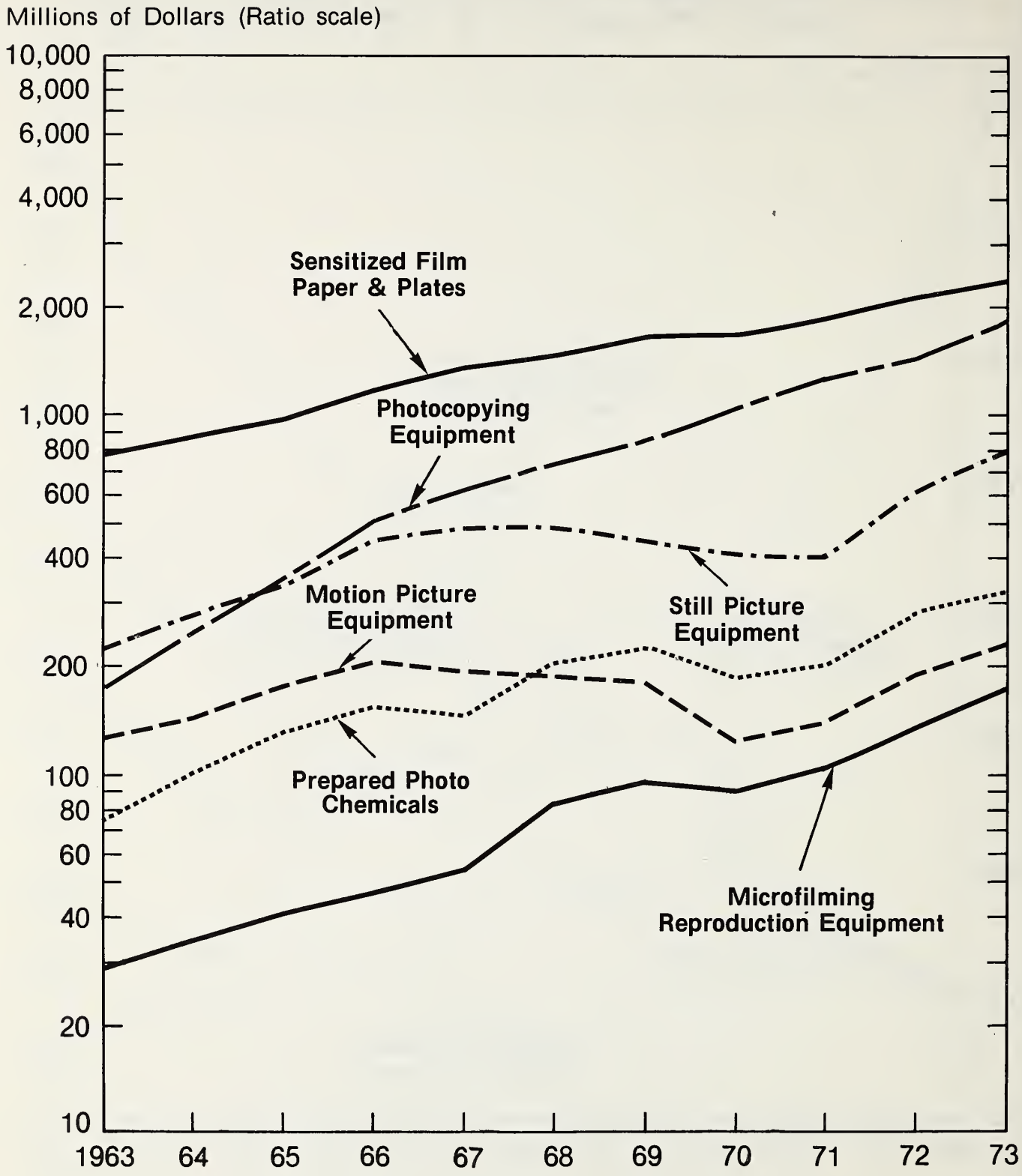
Source: U.S. Bureau of the Census and Survey of Current Business.

Figure 10. Production worker employment and value of shipments per production worker in the photographic industry compared to all manufacturing, 1963-73



Source: Bureau of the Census, Census of Manufactures and Annual Surveys.

Figure 11. Growth profile of product categories, 1963-73



Source: Bureau of the Census and Bureau of Domestic Commerce.

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